UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

MAY, 1886.

PREPARED UNDER THE DIRECTION OF
BRIG. & BVT. MAJ. GEN'L W. B. HAZEN,
CHIEF SIGNAL OFFICER OF THE ARMY,

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SIGNAL OFFICE.
1886.

List of merchant marine steam and sailing vessels from which International Simultaneous Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of May, 1886.

	Name of vessel.	Captain.
	Allan Line.	
Br.	s. s. Buenos Ayrean	Capt. J. Scott.
	Circassian	Wm. Richardson.
	Grecian	C. E. LaGalisi.
	Norwegian	R. Carruthers.
	Nova Scotian	R. H. Hughes.
	Prussian	Alex. McDougal.
	Scandinavian	Alex. McDougal.
	Siberian	R. P. Moore.
	American Line.	
Br.	s. s. British Crown	Geo. Burton.
	British King	John Kelly.
	British Princess	E. H. French.
Am.	Illinois	Geo. H. Dodge.
Br.	s. s. Lord Clive	P. Urquhart.
	Anchor Line.	
Br.	s. s. Acadia	John McKeague.
	Ornento	A. Campbell.
	City of Rome	R. D. Monroe.
	Devonia	Hugh Young.
	Olympia	James Brown.
	Arrow Line.	
Br.	s. s. Critic	W. R. Lord.
	Atlas Line.	
Br.	s. s. Atlas	J. W. Sansom.
	Albano	H. R. Hughes.
Span.	Alps	T. Anasagasti.
Br.	Alvena	O. Hughes.
	Alvo	David Williams.
Span.	Andes	D. d'Amezaga.
	Booth's S. S. Co. (limited).	
Br.	s. s. Clement	Thomas Burley.
	Bordeaux Steam Navigation Company.	
Fr.	s. s. Chateau Lafite	C. Jounnell.
	Bristol City Line.	
Br.	s. s. Brooklyn City	W. Flitt.
	Wells City	T. L. Weiss.
	Channwell Line.	
Am.	s. s. Hudson	H. R. Freeman.
	Louisiana	E. V. Gaeger.
	Cunard Line.	
Br.	s. s. Aurania	W. H. P. Haine.
	Catalonia	Alex. McKay.
	Etruria	T. Cook.
	Pavonia	B. Woolfenden.
	Scythia	T. Roberts.
	Servia	H. McKay.
	Edward Cave's S. S. Line.	
Can.	s. s. Australia	G. Frank.
	Polynesia	A. Kuhn.
	Fabre Line.	
Fr.	s. s. Alesia	—— Vaillat.
	Furness Line.	
Br.	s. s. Boston City	W. T. Shurborne.
	Durham City	M. F. Lund.
	General Trans-Atlantic Steamship Co.	
Fr.	s. s. Amérique	E. Santelli.
	St. Germain	—— Boyer.
	Labrador	P. d'Haxterive.
	Normandie	G. de Kersabiec.
	Great Western S. S. Line.	
Br.	s. s. Dorset	Ch. Off. Wm. H. Bain.
	Guion Line.	
Br.	s. s. Arizona	Capt. J. Price, R. N. R.
	Nevada	John Douglas.
	Wisconsin	Edward Bentley.
	Wyoming	C. L. Rigby.
	Hamburg-American Line.	
Ger.	s. s. Bohemia	R. Karlowa.
	Gellert	W. Kühlcwein.
	Hansonia	H. F. Schwensen.
	Lessing	H. Barends.
	Moravia	G. Petzoldt.
	Rhaetia	H. Vogelgesang.
	Rugia	A. Albers.
	Suevia	C. Ludwig.
	Wieland	C. Belsch.
	Westphalia	E. Kopff.
	Inman Line.	
Br.	s. s. Baltic	Geo. Burton.
	City of Berlin	Francis S. Land.
	City of Richmond	A. W. Lewis.
	Johnson Line.	
Br.	s. s. Nessmore	John Inch.
	Leyland & Holt's Steamship Company.	
Br.	s. s. Niria	F. Graham.
	Pearl	C. J. Watson.
	Euclid	A. W. Pym.
Scot.	Kepping	James Dixon.
Br.	Oliver	James Clarke.
	England Line.	
Br.	s. s. Bulgarian	E. Parry.
	Ningpoian	M. Flitt.
	Mallory Line.	
Am.	s. s. San Marcos	A. C. Burrows.
	Mail S. Dominion S. S. Co.	
Br.	s. s. Montreal	F. Bouchette.
	Sarnia	Joseph Gibson.
	Toronto	Jas. McAuley.
	Monarch Line.	
Br.	s. s. Assyrian Monarch	John Harrison.
	Egyptain Monarch	W. S. Morgan.

	Name of vessel.	Captain.
	National Line.	
Br.	s. s. Denmark	Capt. Geo. Cochrane.
	Egypt	R. W. Grace.
	England	T. P. Heeley.
	Greece	A. J. Jeffrey.
	Helvetia	John Milligan.
	Holland	G. Cochrane.
	The Queen	John Milligan.
	Navigazione Generale Italiana.	
It.	s. s. Indipendente	F. Pirandello.
	New York and Cuba Mail S. S. Co.	
Am.	s. s. Cienfuegos	C. M. Faircloth.
	N. Y., Havana & Mexican Mail S. S. Co.	
Am.	s. s. City of Alexandria	J. W. Reynolds.
	City of Washington	W. M. Rittig.
	North German Lloyd Steamship Co.	
Ger.	s. s. Aller	F. Hamelmann.
	Donau	C. Pohle.
	Eider	H. Helmers.
	Elbe	H. Richter.
	Ems	T. Jungst.
	Fulda	R. Rings.
	Hermann	H. Baar.
	Leipzig	C. Thalenhorst.
	Main	H. Christoffers.
	Rhein	C. Wiegand.
	Werra	Richard Bassius.
	Ocean Steamship Company.	
Am.	s. s. City of Augusta	R. S. Nickerson.
	Chattahoochee	J. W. Catharine.
	Juniata	S. L. Askins.
	Old Dominion Steamship Company.	
Am.	s. s. Manhattan	Frank Stevens.
	Oregon Railway and Navigation Co.	
Am.	s. s. Columbia	Fred Bolles.
	Oregon	E. Poleman.
	Pacific Coast Steamship Company.	
Am.	s. s. Orizaba	John N. Inxalls.
	State of California	G. Debney.
	Pacific Mail Steamship Company.	
Am.	s. s. City of Para	L. Dexter.
	City of Peking	W. C. Dearborn.
	City of Sydney	D. Friele.
	Colima	J. M. Caverly.
	Colon	Chas. C. Lima.
	San Blas	Thos. Chapman.
	Quebec Steamship Company.	
Br.	s. s. Maviel	G. S. Locke.
	Orinoco	Jas. S. Garvin.
	Red Cross Line.	
Br.	s. s. Capsict	W. H. Ellis.
	Red "D" Line.	
Am.	s. s. Philadelphia	Sam. Hess.
	Red Star Line.	
Belg.	s. s. Belgenland	W. A. Seymon.
	Noderland	Allen J. Griffin.
	Noordland	H. E. Nickels.
	Pennland	Rud. Weyer.
	Rhynland	J. C. Jamison.
	Switzerland	H. Buschmann.
	Westernland	Com. W. G. Randle.
	Rotterdam Line.	
Dtch.	s. s. Edam	Capt. J. H. Tast.
	P. Caland	T. H. Bonjer.
	Schiedam	G. Bakker.
	W. A. Scholten	E. J. Vis.
	Zaandam	H. von der Zee.
	State Line.	
Br.	s. s. State of Georgia	G. Moodie.
	State of Indiana	A. Ritchie.
	State of Pennsylvania	A. J. A Mann.
	State of Nebraska	A. G. Brass.
	Thingvalla Line.	
Dan.	s. s. Geiser	C. W. Moeller.
	Hekla	A. G. Thomsen.
	Island	W. Skjöld.
	Twin Screw Line.	
Br.	s. s. Richmond Hill	A. Hyde.
	Warren Line.	
Br.	s. s. Iowa	Samuel Walters.
	Kansas	W. Gleig.
	Norseman	E. Maddox.
	Wells, Ward Line.	
Br.	s. s. Richmond	J. Garson.
	White Cross Line.	
Belg.	s. s. Jan Breydel	H. Meyer.
	Peter de Coninck	E. Smit.
	White Star Line.	
Br.	s. s. Adriatic	H. Parsell.
	Britannic	H. Percy.
	Germanic	C. W. Kennedy.
	Republic	F. J. Irving.
	Wilson Line.	
Br.	s. s. Bessano	W. Rea.
	Buffalo	J. H Maiet.
	Chicago	J. W. Jones.
	Galileo	Richard Potter.
	Marengo	W. Abbott.
	Salerno	R. H. Rogers.
	Miscellaneous.	
Br.	s. s. Aboukir	Capt. Jno. Temple.
	Camden	S. R. Chandler.
	Craigendoran	A. J. Allen.
	Craigholl	W. H. Bennett.

	Name of vessel.	Captain.
	Miscellaneous—Cont'd.	
	Cranbrook	John W. Harvey.
	Edith Golden	John H. Bennett.
	El Cabo	J. Schultz.
	Eudow	T. Robertson.
Span.	Emiliano	D. F. de Bringas.
	Hugo	A. de Mugica.
Br.	Joseph Feroux	J. J. Mehegan.
	Lord Lansdowne	C. H Bashfill.
Am.	Lorenzo D. Baker	Warren F. Wiley.
Br.	Madrid	M. Gaxson.
	Matthew Bedlington	Thomas Kirby.
	Peconic	John Jenkins.
	Peruvian	Moses Parry.
	Raiatea	J. Viereck.
Ger.	Rydel Water	Ch. Off. H. Callieghan.
Br.	Stag	James Adams.
	Sulina	T. Potter.
	Vindolana	Thos. Harrison.
	Viola	L. Murray.
	"New York Herald Weather Service."	
Br.	Adriatic	H. Parsell.
	Alles	J. W. Samson.
	Advance	J. R. Beers.
	Alaska	G. S. Murray.
	Albano	H. R. Hughes.
	Alvena	O Hughes.
	Aurania	W. H. P. Haine.
	Alvo	D. Williams.
	Arizona	Sam. Brooks.
	Baltic	G. Burton.
	Benare	C. J. Watson.
	Britannic	H. Perry.
	City of Alexandria	J. W. Reynolds.
	City of Berlin	F. S. Land.
	City of Chester	H. Condron.
	City of Chicago	Fred Watkins.
	City of Montreal	A. Redford.
Am.	City of Puebla	John Deaken.
Br.	City of Richmond	A. Lewis.
Am.	Colon	Chas. Lima.
Br.	Craighill	W. H. Bennett.
Ger.	Donau	C. Pfeile.
Br.	Etruria	T. Cook.
Ger.	Ems	W. Willigerod.
Am.	Eureka	J. B. Perry.
Ger.	Lessing	B. Voss.
Belg.	Nederland	A. J. Griffin.
Am.	Newport	W. G. Shackford.
Belg.	Noordland	N. E. Nickils.
Br.	Olympia	Jas. Brown.
Dtch.	P. Caland	F. H. Bonjer.
Belg.	Pennland	R. Weyer.
Br.	Republic	P. J. Irving.
	Richmond Hill	A. Hyde.
Belg.	Rhynland	J. C. Jamison.
Dtch.	Schiedam	G. Bakker.
Br.	Servia	A. McKay.
	State of Nebraska	A. G. Brass.
	State of Pennsylvania	A. J. A Mann.
Belg.	Switzerland	N. Buschmann.
Br.	Westernland	Com. W. G. Randle.
	Wisconsin	Capt. E. Bentley.
	Wyoming	C. L. Rigby.
	Sailing vessels.	
Am.	bg. Abbie Clifford	D. W Storer.
Br.	Achsah	A. M. Shaw.
Am.	schr. Annie R. Lewis	L. L. Lewis.
	bg. Arcot	J. W. Cates.
Nor.	bk. Artemis	E. E. Mee.
Ger.	bk. Athena	A. Witte.
Br.	sp. Cesarea	J. C. Barrette.
Ger.	Curt	—. Hashagen.
Br.	Charles S. Whitney	Geo. D. Spicer.
	City Camp	D. McLeod.
Ger.	bk. Cornelius	H. Windhorst.
Br.	bk. E. J. Spicer	Dewis Spicer.
	Edward R. Emerson	A. H. Child.
	bg. Ernestine	E. R. Norton.
Br.	schr. Etta A. Watt	G. T. LoCompte.
Am	Ettie H. Lister	S. D. Mason.
Br.	bk. Exile	Geo. J. Pearce.
Am.	bg. Georgietta	Ch. Off. H. E. Combs.
Nor.	bk. Grundloven	Capt. O. G. Ellingsen.
Am.	Havana	B. F. Rice.
Am.	schr. Henry Waddington	W. H. Meyer.
	Joseph Souther	J. W. Watts.
Nor	sp. Komandor Svend Foyn	John Bryde.
Br.	bg. Lilian	H. F. Schive.
Br	bkt. Lydia	Geo. Lowery.
Am.	bg. L. & W. Armstrong	A. Alexander.
Am.	schr. Maggie Abbott	D. C. McIntosh.
	bg. Mary Fink	D. B. Darrah.
	sp. Mary L. Stone	G. L. Josselyn.
	schr. Mary Jane Elizabeth	C. E. Bohannon.
Ger.	sp. Palme	W. Bahls.
	bk. Richard	A. von Seggern.
Den.	Risito	N. P. Hansen.
Br.	bkt. Rosebud	John Collie.
Am.	schr. Sarah D. J. Rawson	Thos. D. French.
Br.	sp. sapphire	Geo. W. Murray.
Ger	Shakspere	Carl Muller.
Am.	bg. Tenerife	N. S. Tracy.
	bk. Tittle Baker	Jas. H. Cartt.
Aust.	The Lord Warden	G. N. Gwolino & Co.
Ger.	Western Chief	Fr. Sander.
Br.	sp. Winnifred	R. MacDonald.

MONTHLY WEATHER REVIEW.

VOL. XIV. WASHINGTON CITY, MAY, 1886. No. 5.

INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during May, 1886, based upon the reports from the regular and voluntary observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic Ocean during the month are also given, and their approximate paths shown on chart i. In tracing the centres of the paths of these storms data from the reports of two hundred and four vessels have been used.

Unusually large masses of ice, both field and bergs, have been observed in the vicinity of Cape Breton and Newfoundland during the month.

On chart i are shown the approximate paths of eleven areas of low pressure which have been traced over the United States and British America. The average number of areas of low pressure for May during the last twelve years is 8.4.

The most severe local storms of the month occurred on the 11th, 12th, and 13th, during the prevalence of low area number v.

Over the country to the westward of the eighty-fifth meridian the monthly precipitation was much below the average, while in the Ohio Valley, middle Atlantic states, and over a part of the south Atlantic states there has been a marked excess.

The mean temperature has been normal or slightly below over the greater part of the country east of the Mississippi River; to the westward of the Mississippi the mean temperature has averaged from 2° to 6° above the normal, except in California, where it was about normal.

In this REVIEW will be found a tabulated statement of tornadoes, &c., prepared by Lieut. J. P. Finley, of the Signal Corps.

Chart vi exhibits curves representing results of observations, with the electrometer, upon atmospheric electricity, and under that head will be found notes referring to the same.

In the preparation of this REVIEW the following data, received up to June 20, 1886, have been used, viz., the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and thirty-three Signal Service stations and twenty-two Canadian stations, as telegraphed to this office; one hundred and sixty monthly journals; one hundred and fifty-seven monthly means from the former, and twenty-two monthly means from the latter; two hundred and eighty-seven monthly registers from voluntary observers; sixty-four monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the New England Meteorological Society, and from the local weather services of Alabama, Georgia, Indiana, Kansas, Minnesota, Missouri, Nebraska, Ohio, and Tennessee, and of the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE.

[*Expressed in inches and hundredths.*]

The distribution of mean atmospheric pressure for May, 1886, determined from the tri-daily telegraphic observations of the Signal Service, is shown by isobarometric lines on chart ii.

It will be seen from this chart that the pressure is greatest in the Pacific coast region and in Florida. The isobar for 30.05 indicates the region of greatest pressure and is traced along the Pacific coast. The isobar of 29.85 indicates the regions of least mean pressure; there are two of these areas, one in Arizona and New Mexico, and the other in the Saint Lawrence Valley. From New Mexico the pressure gradually increases toward the east until in Florida it reaches 30.00.

As compared with the mean pressure of the preceding month a decided decrease is shown over the whole country, except in the Rocky Mountain region and westward to the Pacific, where there was an increase, the greatest being .08 in Washington Territory. The deficiency was greatest in New England and the Saint Lawrence Valley, the mean pressure for these regions falling 0.25 below that of April. From Montana southward to Arizona, New Mexico, and Texas, the pressure differs very little from that for April.

The departures from the normal pressure at the various Signal Service stations are given in the tables of miscellaneous meteorological data, and on chart iv they are shown by lines connecting points of equal departure. The pressure for May was about normal in Washington Territory and Oregon, and on a line extending from the boundary of the United States and the British possession, at the meridian of one hundred and ten, southeastward to Florida. From this line southwestward the pressure rises above the normal, reaching 0.10 in New Mexico and Arizona, and falls below in all regions lying to the east, New England being 0.09 below the normal pressure for May.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are also shown in the tables of miscellaneous data; they were greatest at stations in the Lake region, New England, and along the Atlantic coast, and least in California, Arizona, New Mexico, and Texas.

The following are some of the extreme monthly ranges:

Greatest.	Inch.	Least.	Inch.
Eastport, Maine	0.99	San Diego, California	0.25
Portland, Maine	0.91	Los Angeles, California	0.26
Cape Hatteras, North Carolina	0.91	Key West, Florida	0.27
Boston, Massachusetts	0.89	Fort Apache, Arizona	0.29
Kitty Hawk, North Carolina	0.89	Prescott, Arizona	0.29
Mount Washington, New Hampshire	0.89	Cedar Keys, Florida	0.34
Chincoteague, Virginia	0.88	Sanford, Florida	0.36

AREAS OF HIGH PRESSURE.

Eight areas of high pressure appeared within the limits of, or near, the stations of observation during the month of May. Of the eight areas traced, but one pursued the normal southeasterly course. Three of these areas passed eastward north of the Lake region, and four were first observed on the Pacific

coast, and of these four, two passed to the east of the Mississippi valley. The general movement of these areas, after reaching the Atlantic coast, was slightly to the north of east, and on the Pacific coast the movement was directly northward, while the area remained near the coast line.

I.—This area was central north of Lake Superior on the morning of the 1st; it moved directly southward over the upper lake region, covering the central valleys during the 2d and 3d, attended by fair or clear weather throughout all districts east of the Rocky Mountains. It was central in eastern Tennessee on the morning of the 3d, and on the 4th and 5th the movement was to the southeast, passing off the Atlantic coast. This was an extended area of high pressure, and was well-defined, but the gradient was slight.

II.—This area of high pressure extended over the north Pacific on the morning of the 1st, and it remained almost stationary until the morning of the 2d, after which it moved to the eastward north of the stations of observation on the morning of the 6th, and was probably central off Manitoba. It moved slowly eastward north of the Lake region during the 7th, and was central northeast of New England on the morning of the 8th. The highest reading of the barometer observed during the transit of this area of high pressure was 30.33, on the north Pacific coast on the morning of the 1st. During the movement eastward over the continent the pressure within this area was generally below 30.20. The easterly movement, after crossing the Rocky mountains, was attended by an area of low pressure which moved eastward along the thirty-fifth parallel. After reaching the Atlantic coast this area and the attending low area apparently inclined to the northeastward.

III.—This area followed quickly in rear of the high area previously described, advancing southeastwardly from the Hudson Bay region, and was central north of Ontario at midnight of the 9th, extending southeastward and separating low areas of considerable energy then central northeast of New England, in the Lake region, and north of Minnesota. The high area moved eastward over New England and Nova Scotia on the 10th and 11th, the pressure increasing slowly with the easterly movement. On the morning of the 12th it was last observed east of Nova Scotia.

IV.—This high area appeared on the northern California coast during the 11th, and moved slowly northward to the west of the coast until the afternoon of the 15th, when it was central over Washington Territory, and extended east and southward over the northern and middle plateau regions. The maximum pressure of 30.36 occurred on the afternoon of the 15th at Fort Canby, Washington Territory. The high area moved east of the coast line, and was central over the northern plateau region on the morning of the 16th, after which it disappeared by a gradual decrease of pressure, without passing to the eastward of the Rocky Mountains.

V.—Number v formed over Texas on the 15th, bounded by isobars of 30.1 and 30.2. It moved northeastward and covered the entire Mississippi, Ohio, and lower Missouri valleys on the morning of the 16th, the pressure having increased slightly during the northeasterly movement. This increase continued during the 16th and 17th while this area was moving eastward over the Lake region and middle Atlantic states. The barometer was generally above 30.3 near the centre of this area when it passed east of the Atlantic coast.

VI.—This was a slight area of high pressure which appeared in northern Dakota on the 19th, when areas of low pressure were observed to the east, west, and south of it. On the morning of the 20th this high area had reached the upper lake region, and the areas of low pressure referred to were central, respectively, in the lower Saint Lawrence Valley, east Gulf states, and north of Dakota. The easterly movement continued during the 20th, the area passing over the upper Saint Lawrence Valley, where it disappeared.

VII.—Number vii was first observed on the north Pacific coast on the morning of the 20th; it passed first to the northeastward over Washington Territory and thence southeastward, crossing the Rocky Mountains, and was central in eastern Colorado on the morning of the 23d. It moved northeastward from the central Rocky Mountain region during the 23d and 24th, extending over the central valleys; it was central north of Minnesota on the morning of the 24th, in eastern Iowa on the morning of the 25th, and in eastern Tennessee on the morning of the 26th, after which its centre could not be located.

VIII.—This area apparently advanced from the Pacific and was observed on the central California coast at midnight of the 26th. It extended over the Pacific coast states and the plateau regions during the 27th, the centre apparently moving directly northward until the afternoon of the 28th, when it disappeared to the north of Washington Territory. The reports for the succeeding days of the month indicate that this area moved southward and was again central off the north Pacific coast at the close of the month.

AREAS OF LOW PRESSURE.

Eleven areas of low pressure have been traced on the tri-daily weather charts during the month of May. Five of the areas so traced passed eastward over British America, causing but slight changes in the weather conditions within the limits of the United States. Two storms, of considerable energy, apparently developed on the Atlantic coast, and one storm, also of considerable energy, after reaching the Mississippi Valley separated into several minor disturbances, which disappeared before reaching the coast. The tracks of the areas of low pressure traced are generally to the north of the mean storm-tracks for May, and the direction of movement on the Atlantic coast is more northerly than usual.

The following table shows the latitude and longitude in which each area was first and last observed, and the average rate of movement in miles per hour:

Areas of low pressure.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	
No. I	51 00	96 00	48 00	63 00	27.0
II	36 00	100 00	48 00	32 00	27.0
III	43 00	102 00	38 00	74 00	24.0
IV	53 00	105 00	50 00	87 00	20.0
V	48 00	104 00	42 00	89 00	30.0
VI	54 00	100 00	50 00	65 00	31.0
VII	30 00	89 00	32 00	86 00	8.0
VIII	54 00	107 00	50 00	61 00	30.0
IX	53 00	117 00	51 00	82 00	28.0
X	43 00	69 00	51 00	68 00	15.0
XI	53 00	98 00	52 00	66 00	33.0

Average hourly velocity, 24.8 miles.

I.—On the afternoon of the 3d this area of low pressure was first observed north of Minnesota; it had moved southeastward over Lake Superior by the morning of the 4th, attended by rains in the northwest and upper lake region, and severe local storms in the lower Missouri valley, there being, at that report, a secondary low area central over Kansas. This storm moved almost directly eastward from Lake Superior during the 4th, and was central near Montreal, Province of Quebec, on the morning of the 5th. During its advance the barometer fell below 29.60 near the centre of disturbance, but it rose slightly after passing to the east of the Saint Lawrence Valley. The course changed to the north of east after reaching the coast line, and it was last located as central over the Gulf of Saint Lawrence.

II.—This area of low pressure has been clearly traced from northern Texas from the successive tri-daily reports after May 5th, but previous reports indicate that it originated to the west of the Rocky Mountains, and that it probably passed northward over the southern plateau region during the earlier days of the month. It moved directly east along the thirty-fifth parallel, increasing in energy and attended by heavy rains and severe local storms at stations near the centre of disturbance. After reaching the eastern part of South Carolina the

course changed to the northeast, and the storm passed along the middle Atlantic and New England coasts during the 8th and 9th, causing severe gales first from the northeast and afterwards from the northwest. It passed to the east of Nova Scotia, causing brisk and high winds and very heavy rains in the Maritime Provinces. The course apparently became more northerly after the centre reached the vicinity of Halifax, Nova Scotia.

III.—The tri-daily reports received during the 7th and 8th indicated that an area of low pressure was forming over the Rocky Mountain regions, and on the morning of the 8th the centre of this disturbance was approximately located in the southwestern part of Dakota. It moved southeastward, extending over Nebraska and Kansas; between the afternoon and midnight reports of the 8th it moved in a southwesterly direction, and was central in western Kansas at midnight of the 8th. During the 9th it moved eastward, the centre passing over northern Kansas, southeastern Nebraska, and southern Iowa, the barometer falling to 29.39 at Des Moines, Iowa, at 3 p. m. of the 9th. This storm reached its maximum energy, accompanied by very heavy rains, severe local storms and tornadoes, during its transit over Iowa and eastern Kansas. After passing over southern Illinois and Indiana during the 10th it became a slight disturbance, losing its cyclonic form completely as it passed over the lower lake region, and it could only be traced as a feeble depression passing over the middle Atlantic states and off the middle Atlantic coast on the 11th.

IV.—This storm was at no time within the limits of the stations of observation. It appeared north of Montana at midnight of the 9th, and moved eastward, inclining slightly southward, being near to, and north of, Fort Garry, Manitoba, at midnight of the 10th, when the barometer was 29.40. The preceding report showed a still lower barometer reading of 29.31 at Minnedosa, with high west and southwest winds. This storm developed great energy while moving from the Rocky Mountains eastward over Manitoba, and it was preceded by strong southerly and followed by strong northerly winds, until its centre reached the vicinity of Lake Superior. It disappeared during the 12th without causing any marked disturbance over the region east of the Mississippi, and it probably moved northeastward over the Hudson Bay region.

V.—Number v was observed in the central Rocky Mountain region on the afternoon of the 11th, when it extended from Montana and Dakota southward to Texas, the centre of the depression being near Deadwood, Dakota. Previous to the development of this depression an area of low pressure was observed in eastern Colorado on the morning of the 10th. This secondary depression moved slowly to the southeastward until the morning of the 11th, the movement being readily traced by the direction of the winds within the slight barometric depression. After the development of number vi to the northward, these depressions united in western Missouri. Very heavy rains and severe local storms occurred during the 11th and 12th when this disturbance was moving eastward over Missouri, Iowa, and Illinois, and the heavy rains extended eastward over the northern states during the 12th and 13th. The area of low pressure, after reaching northern Illinois, divided into several small depressions, the movements of which are not traced on chart i, as they had disappeared after the second or third reports.

The following reports of severe local storms and tornadoes, which occurred during the prevalence of this low area, have been received:

Warrensburg, Johnson county, Missouri: about noon of the 11th a heavy thunder-storm, accompanied by hail and a furious gale, occurred at this place. The storm came from the northwest, demolishing fences and trees and damaging buildings. In the country to the east of this town wheat was greatly injured by hail, which was driven with much force by the high wind. At Odessa, twenty-five miles northwest of here, four churches were demolished.

Evansville, Vanderburgh county, Indiana: a very severe thunder-storm, attended by violent wind, occurred on the afternoon of the 11th. The African Baptist church, a large brick building, was thrown down; the upper portion of a store was wrecked; tin roofs were stripped from a number of houses, allowing the rain to do great damage to their contents; fences, trees, and chimneys were blown down by the hundreds; steamboats, tugs, and other craft in the river weathered the gale with difficulty and suffered considerable damage.

Peru, Miami county, Indiana: trees were uprooted, houses unroofed, and wheat blown down by the storm of the 11th. A large amount of stock is reported to have been killed by lightning.

Leavenworth; Kansas: a heavy thunder-storm began at 10.30 a. m. and continued until 1.10 p. m. of the 11th. This storm was the most disastrous that has occurred in the vicinity for years. At 12.20 p. m. the rain began to fall in great quantities, the wind increased rapidly in force and soon acquired a velocity of forty-five miles per hour, which continued for five minutes; cellars were flooded in an incredibly short time, and trees, fences, and sign-boards blown down. The iron ventilators of the Union depot were blown away; the roof of the market house was lifted from the building and thrown on several houses, damaging them to the extent of many thousand dollars. The rainfall was very heavy, 1.80 inches falling in fifty minutes. This storm prevailed throughout this entire section of country, several of the adjacent towns reporting serious damages.

Sedalia, Missouri: soon after noon on the 11th Sedalia experienced a very heavy rain and hail-storm. The storm was accompanied by a severe gale, which was of short duration. The galvanized iron cornice on the north side of the new court house was blown off. Rain fell in torrents, the sewers proving inadequate to carry off the volume of water.

Vichy Springs, Maries county, Missouri: a considerable part of this town was destroyed by the storm of the 11th. A majority of the residences and many of the business blocks were unroofed and almost completely demolished, but no lives were lost and only four persons were injured.

Green Ridge, Pettis county, Missouri: the village of Green Ridge suffered severely by the storm of the 11th. Houses were moved from their foundations, out-buildings destroyed, fences blown down, and great damage done to fruit and shade trees. The glass in the windows of nearly every building in town, exposed to the fury of the storm, was shattered by hail. No lives were lost, but several persons were injured.

Chicago, Illinois: on the night of the 11–12th a gale occurred at Chicago, doing some slight damage, the wind reaching a velocity of only twenty miles per hour, but in other parts of the state the storm was quite severe. At Chester houses were unroofed, and in many cases completely demolished. At Lanark wind-mills, barns, fences, and frame buildings of various kinds were blown down. The Methodist church at Atwood was struck by lightning, and fruit trees stripped of leaves by the hail. At Buena Vista the school house, residences, and stores in all parts of the town were badly damaged.

Logansport, Indiana: during the afternoon of the 12th a severe thunder-storm, accompanied by high wind and hail, occurred at this place. Many houses were unroofed and several were struck by lightning. Although the storm continued but half an hour, it was the most destructive that has visited this place for many years.

Lebanon, Warren county, Ohio: a severe thunder-storm, attended by heavy rain, hail, and wind, occurred at this place at 10 p. m. of the 12th. Several buildings were unroofed and telegraph communication cut off.

Winchester, Virginia: a disastrous thunder-storm, accompanied by high wind and hail, occurred at this place on the 12th. The wind attained great velocity, and hailstones, some the size of walnuts, fell to the depth of two inches, stripping trees of their foliage, and breaking window glass. The rainfall was very heavy, washing the streets and filling cellars.

Variety Mills, Nelson county, Virginia: the volunteer observer here reports as follows: The period between the 11th and 15th was marked by great meteorological activity. The rainfall in the central and northeast parts of the county was enormous, and numerous thunder-storms occurred. From 3 a. m. to 4.30 a. m. of the 13th the discharge of electricity was almost incessant.

The storm of the night of the 12–13th was very destructive to property in Madison, and other counties of Kentucky. The rainfall was very heavy, causing streams to overflow and submerge many farms. In Fayette county the flood is described as a water-spout. In Clinton county the chief damage was caused by wind; five barns were destroyed and much timber was prostrated. Butler county also sustained great damage by wind. Fifty feet of the Woodsdale bridge over the Miami River were blown off. In the village of Seven Miles the streets were rendered impassable by fallen trees. The public school building was badly damaged, and the roof of a church was thrown against the parsonage, crushing its walls.

Sandusky, Sandusky county, Ohio: during the night of the 12–13th the inhabitants of the eastern part of this county suffered a loss of about $75,000 from the effects of a heavy wind, accompanied by rain. Large trees were blown down, houses destroyed, and many persons injured. At Bellevue large hail-stones fell, killing swine, sheep, and fowls, and breaking windows. This storm also did considerable damage in Erie county, where it was accompanied by the characteristics of a tornado.

Shawnee, Perry county, Ohio: a disastrous storm occurred at this place on the night of the 12–13th, doing damage to the extent of several thousand dollars. The railroad entering this town was washed out at places, causing a delay of trains. Two residences were struck by lightning and badly wrecked. The lower part of the town was flooded and many persons narrowly escaped drowning.

Wilmington, Clinton county, Ohio: the storm of the night of the 12–13th began at this place at about 10 p. m. Trees, barns, and houses were blown down or much damaged.

Circleville, Pickaway county, Ohio: a severe wind-storm, with heavy rain,

passed over this county on the night of the 12–13th. Trees and telegraph wires were blown down at this place. The damage to property was more extensive in the surrounding country.

Long Branch, New Jersey: the storm of the 13th was felt severely along the northern coast of New Jersey. The beaches for miles were badly washed and much damage was done to the valuable bluff fronting the ocean drive-way.

Tipton, Tipton county, Indiana: during the storm of the 13th the buildings on the fair grounds were blown down and many private residences in the town badly wrecked, killing one person and wounding others. Numbers of horses and cattle were killed by falling trees. In White county the wind was disastrous in its effects, many farms being left without buildings or orchards, and much stock was killed.

Albion, Calhoun county, Michigan: a heavy wind and rain storm occurred at this town at 5.30 p. m. on the 14th, flooding the streets in ten minutes after it began. Five stores were unroofed and their contents damaged by rain.

Fredericksburg, Virginia: the storm of the 14th did considerable damage in this vicinity. Crops, fruit trees, and gardens were destroyed or injured by wind, rain, or hail. Along the north bank of the Rappahannock River, from Leedstown, in Westmoreland county, to the mouth of the river, farm property was damaged by flood and wind.

Saint Louis, Missouri: about 6 p. m. of the 14th a heavy rain and wind storm passed over this city, coming from the west. The rainfall was very heavy, 3.30 inches falling during the storm. All the low land in the city was flooded, and cellars and basements partially filled, doing great damage to their contents.

Lancaster, Fairfield county, Ohio: a destructive storm of wind and rain occurred at this town and vicinity on the night of the 14–15th. A number of business houses and residences were unroofed and two school buildings damaged. In the streets were scattered portions of trees and the débris of buildings. Reports from the surrounding country show great injury to wheat and other crops.

By reference to the descriptions of storms, etc., in this REVIEW, under the headings of "Local storms and tornadoes," "Floods," and "Hail," it will be seen that the most severe atmospherical disturbances of the month occurred during the prevalence of this area of low pressure.

VI.—When the low area previously described was central over northern Illinois, number vi appeared to the north of Manitoba and moved southward over Minnesota, while a secondary depression formed over eastern Kansas and moved northeastward over Iowa. This depression was trough-shaped and moved slowly eastward during the 13th, crossing the Mississippi Valley, with the principal depression moving southward from Minnesota to central Illinois, and a secondary depression moving eastward north of the upper lake region. During the 14th this storm increased in energy, and moved slowly to the northeastward, north of the Ohio Valley, attended by general rains and severe storms from Tennessee and Arkansas northward to the Lake region. On the 15th it moved slowly down the Saint Lawrence Valley, attended by increasing pressure at the centre of disturbance. This storm attained its maximum energy while passing over the Lake region, the barometer reading a minimum of 29.43 at Montreal, Province of Quebec, on the morning of the 15th. The barometric pressure on the New England coast ranged from 30.00 to 30.13. This disturbance was last observed north of the lower Saint Lawrence Valley, apparently moving to the northeast.

VII.—On the 18th this area of low pressure apparently moved northward over the Gulf of Mexico, causing dangerous winds on the east Gulf coast. It moved slowly northward over Mississippi and northern Alabama during the 18th, 19th, and 20th, the barometric gradient being very slight. The centre of depression was located approximately by the directions of winds at neighboring stations. This area disappeared on the 21st in southern Alabama, although the succeeding tri-daily reports show local storms in Georgia and Alabama on that date.

VIII and IX.—These areas of low pressure probably passed from the north Pacific coast eastward to the Atlantic north of the stations of observation. They followed each other with an interval of thirty-two hours, moving eastward in the same latitude, and were attended by no marked change in the weather conditions within the United States, except in the region west of Lake Superior. They appeared north of Montana, and on the mornings of the 18th and 19th, respectively, and they disappeared on the 21st, north of the Saint Lawrence Valley.

X.—Number x was located east of, and near, the New England coast on the afternoon of the 25th. The tri-daily reports on the 24th and morning of the 25th indicate the presence of a feeble depression on the middle Atlantic coast. The movement was slowly to the northward, and at midnight of the 24th the centre of this disturbance was apparently over eastern New York. Between midnight of the 24th and 7 a. m. of the 25th the movement was easterly, but on the afternoon of the 25th it was clearly defined as a disturbance of considerable energy. It moved northward to Eastport, Maine, and thence northwestward during the succeeding sixteen hours, when the centre moved to the west of the Saint Lawrence River, near Father Point, Province of Quebec. During this northwest movement the barometer fell from 29.42 to 29.26, and dangerous winds occurred at stations within the disturbance; the winds also reached velocities ranging from thirty to forty-four miles per hour on the New England coast. This storm apparently moved northward from the Saint Lawrence Valley, although a secondary depression formed to the southwest on the 27th, and passed directly eastward to the New England coast.

XI.—Number xi appeared north of Manitoba on the morning of the 28th. It remained north of the stations of observation, moving slightly to the south of east until it reached the meridian of Washington, and latitude 49°, after which the course changed to the north of east, and it passed beyond the limits of the stations during the 30th. It was at no time central within the United States. When the centre reached the most southerly point of its course stong westerly winds occurred in the upper lake region. The barometer was below 29.50 in Manitoba when the depression passed over that section, and it was above 29.70 when the centre was in the lower Saint Lawrence Valley.

NORTH ATLANTIC STORMS DURING MAY, 1886.

[*Pressure in inches and millimetres; wind-force by Beaufort scale.*]

The paths of the depressions that have appeared over the north Atlantic Ocean during the month are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data received at this office up to June 21, 1886.

Of the ten depressions traced during the month, one, number 9, is a continuation of areas of low pressure traced on the North American continent; number 1 first appears off the coast of the United States in N. 34°; number 2 is a continuation of depression number 11, described as a north Atlantic storm for April, 1886; number 3 developed near N. 36°, W. 47°; numbers 4 and 5 originated over the ocean west of W. 55°; number 6 is first charted in N. 55°, W. 24°; numbers 7 and 9 appeared off the southeast coast of Ireland, and number 10 is traced off the northwest coast of Spain.

The following presents the characteristics of the depressions traced for the present month as compared with those traced over the north Atlantic for May, 1885:

In May, 1885, ten depressions were traced; the general direction of the movement of the storm-centres being east-northeasterly, excepting those which first appeared near the British coasts; these moving south of east. East of the fiftieth meridian the tracks were located within a path bounded by N. 40° and N. 55°.

In May, 1886, the positions of storm-tracks were greatly diversified, extending from N. 36° to N. 60° from the fiftieth meridian to the European coast; their general direction being east-northeast, with a rather rapid rate of progression, except in the case of depression number 1, which made slow progress after passing the thirty-fifth meridian. One depression, number 8, disappeared over the ocean northeast of Newfoundland, and one, number 4, pursued a southerly course from N. 37°,

W. 55°. In no instance were pressures below 29.00 (736.5) reported.

The month opened with an area of low pressure off the coast of the United States, accompanied by moderate to fresh gales. A second depression of considerable energy and widely extended influence was central in about N. 47°, W. 34°. These depressions caused generally low pressures and unsettled weather between N. 35° and N. 55° until the 3d, when an area of high pressure appeared off the southeastern coast of the United States; extending eastward over the ocean, this area of high was succeeded by lower pressure off the coast of the United States from the 7th to the 10th. During the first ten days of the month the weather was generally unsettled east of the fortieth meridian, with moderate gales and rain. Fresh northerly gales and rain were encountered in N. 40°, W. 40° to 55°, and N. 48° to 50°, W. 25° to 30°, on the 11th.

A region of low pressure was located south of the West Indies from the 7th to 10th, inclusive.

On the 12th a storm of great energy developed off the southeast coast of Ireland. On the 13th this storm had moved southeastward, exhibiting barometric pressure 29.18 (741.2), and was accompanied by wind of force 9 and 10 and rain. On the 14th strong northerly gales continued off the eastern coast of Ireland, diminishing in force during the two succeeding days. This storm appeared too far to the eastward to admit of charting on the ocean storm-track map, but its development was probably subsidiary to charted depression number 1, which disappeared to the eastward of the British Isles on the 11th. From the 11th to the 20th the pressure increased over the mid-Atlantic, south of the fiftieth parallel, and numerous rain-areas and moderate gales were encountered. From the 20th to the 25th comparatively fair weather prevailed from coast to coast, some rain being reported over the mid-Atlantic from N. 50° to 60°. From the 25th to the close of the month no special features are noted, save the development on the 30th of a depression off the northwestern coast of Spain.

The following are brief descriptions of the depressions charted:

1.—This storm is traced entirely across the north Atlantic, and is first charted, on the 1st, off the coast of the United States in N. 34°, W. 76°. On the morning of that date, pressures ranging below 29.60 (751.8) are exhibited. Under this date the following reports are made in connection with this storm:

Capt. N. S. Tracy, commanding American brig "Teneriffe," situated in N. 36°, W. 74°: "All night it has been blowing terrific squalls, with thunder and lightning; total darkness and a very bad sea."

The s. s. "Halley," W. P. Ballantine, commanding, in N. 35° 28′, W. 71° 03′, encountered a hurricane, beginning at 8 p. m. of the 1st, and continuing until noon of the 2d. The wind set in from the southwest and veered to the northeast, lowest barometer 29.38 (746.2), at 4 p. m. of the 2d.

The brig "John McDermott," in N. 34°, W. 74°, experienced a heavy gale from the n. to nw., with very heavy seas.

The schooner "Seventy-six," in N. 29°, W. 64° 30′, encountered heavy nw. gales, which continued three days.

Captain Macon, commanding the s. s. "Lone Star," makes the following report: "N. 28° 26′, W. 79° 40′, from April 30th to May 3d; lowest barometer, 29.58 (751.3), at 12 midnight (Greenwich mean time) of April 30th. This was the heaviest gale I remember for the time of year; with very heavy cross seas n. to e. ne.; squalls of the heaviest kind. The wind set in from the w., veering to nw. and n.; winds following n., ne. to se., and s."

S. S. "Manhattan," Frank Stevens, commanding: "N. 34° 04′, W. 76° 55′, 5.02 a. m., wind shifted suddenly from se. to sw. in a violent squall; wind blowing with great force, and heavy rain, with sharp lightning and heavy thunder; barometer had fallen to 29.42 (747.3) before it struck. Gale lasted two hours, hauling gradually to nw., blowing hard and clearing off."

On the morning of the 2d this depression had moved east-northeast, to N. 36°, W. 69°, with energy unabated. Under this date reports are made as follows:

The schooner "Joseph W. Foster," in N. 38°, W. 73°, experienced a heavy gale from the nne., lasting thirty-six hours, during which a terrific sea struck the vessel, breaking the rudder, flooding the cabin, and washing everything movable from the deck.

Capt. N. S. Tracy, commanding brig "Teneriffe," states that "in thirty-two years' experience, as master, he never saw such weather. It was a cold north gale, with very heavy rain and heavy confused sea running from n. to e."

Heavy rain and strong east to northeast gales were encountered by vessels to the northward and northwestward of the storm-centre during the 2d.

On the morning of the 3d the low area had advanced e. ne. to N. 38°, W. 59°, with a central pressure of about 29.40 (646.7); strong gales and rain continuing east of the seventy-fifth meridian. On this date the bark "Mary E. Hall," in N. 34°, W. 73°, had a heavy gale from the west, lasting forty-eight hours. Everything on deck was washed away; sails split and cabin flooded.

W. H. Eills, commanding the s. s. "Capulet," reports: "In N. 39° 50′, W. 55° 12′, experienced a north gale; 9 a. m., wind ne., force 6, heavy rain, barometer 29.80 (756.9); 9 to 11 a. m., wind steady in direction from ne., gradually increasing in force; 11 a. m. to 2 p. m., gale increased, with heavy squalls at force 9 to 10, and continuous heavy rain, and high, true sea from ne., barometer steady at 29.80 (756.9); 2.30 p. m., wind decreased to force 6, and suddenly veered to nw., w., sw., and w., then fell light to force 3, weather clearing to westerly; 3 to 4 p. m., wind veered round to nw. and n. to ne., increasing rapidly, with rain, gale blowing with force 9, with squalls at force 10 to 11, with continuous heavy rain, high confused sea from ne., barometer 29.75 (755.6); 7 p. m., gale increased to force 10, with very high sea from ne., rain and misty weather; 9 p. m., wind increased to force 11, barometer 29.70 (754.4); 9 to 12 midnight, gale decreased to force 9, barometer at midnight 29.60 (751.8), followed on the 4th by increasing pressure and wind backing to nw.

At noon (Greenwich mean time) of the 4th this storm was central in N. 41°, W. 48° 30′, with an increase of barometric pressure, and a slight loss of energy. Strong gales and rain were reported to the eastward, and rain to the north and northward. Under this date Capt. B. Jamieson, commanding s. s. "Sidonian," reports: "In N. 41° 44′, W. 39° 09′, at noon, fresh gales began from se., veering to sw." The s. s. "Ponca," Capt. William Bowen, in N. 36° 58′, W. 40° 48′, at 8 a m. encountered a fresh gale from the south; heavy rain and squally; wind veered to sw. in p. m., and continued moderate gale, rain and squally; barometer 29.78 (756.4) at 9.30 p. m.

At 12 noon (Greenwich mean time) of the 5th the area of low pressure was located in N. 41°, W. 42°, having moved due eastward about 6° since the preceding day, accompanied by strong gales and rain. On this date the s. s. "Ponca," in N. 37° 13′, W. 44° 37′, encountered strong winds from the sw. and heavy rain. At 8 a. m. the wind veered to nw. and increased to fresh gales at noon, and to strong gales at night; barometer, at 8.45 a. m., read 29.74 (755.4). The s. s. "Sidonian," in N. 42° 0′, W. 44° 25′, encountered a sw. gale, veering to n. at noon, and increasing to whole gale, which continued with very heavy squalls until 4 a. m. of the 6th, in N. 42° 23′, W. 49° 16; then moderated and backed to nw. and sw., with strong to fresh breeze and fair weather. Lowest barometer during the gale was 29.97 (761.2) from midnight to 6 a. m. of the 5th.

On the 6th this storm was central near N. 45°, W. 36°, with rain to the eastward and northward, and an appreciable increase in pressure. Pursuing a southeasterly course the depression is charted on the 7th to N. 44°, W. 33°, with rain to the northwestward and fresh gales to the west and southwest. During the next twenty-four hours it moved south of east to

N. 43°, W. 28°, with increasing pressure and a marked loss of force. From this point it moved east-northeast to N. 45°, W. 20°, on the 9th, with rain and moderate winds to the northwestward. At 12 noon (Greenwich mean time) the storm-centre had moved northeastward to N. 47°, W. 15°, with rain to the northwestward, and fresh northerly gales to the westward. The pressure had risen decidedly, and the storm lacked violent features. During the 11th this depression disappeared to the eastward of the region of marine reports.

2.—This storm is a continuation of depression number 11, charted for April, 1886, and is taken up, May 1st, in N. 48°, W. 34° 30′, with a central barometric pressure of 29.00 (736.6). To the northeastward and eastward fresh gales and rain were reported. On this date the s. s. "Otranto," Captain Rippeth, in N. 49° 36′, W. 10° 42′, experienced a strong gale from the south, beginning in p. m. and continuing until a. m. of the 2d, in N. 49° 27′, W. 16° 35′, when it moderated and veered to sw.; lowest barometer, 29.69 (754.1), at noon on the 2d. The s. s. "City of Richmond," A. W. Lewis, commanding, in N. 48° 46′, W. 31° 30′, had a ne. gale of force 8, commencing at 6 p. m. of the 1st, and continuing until 8 p. m. of the 2d. From the forenoon of the 1st the wind backed to s., se., e., ne., nw., and wnw.; lowest barometer, 29.05 (737.9), at 1 p. m., May 1st.

The s. s. "Austrian," Captain Parker, in N. 51° 7′, W. 28° 11′, experienced a strong gale from the sse., veering to s., sw., and w., and to nw., following the passage of the disturbance; lowest barometer, 29.15 (740.4), from 2 to 4 a. m., May 2d. The s. s. "Edam," Capt. J. H. Taat, in N. 46° 13′, W. 38° 52′ encountered a strong gale from the nw., wind veered to nnw. and n., and to ne., following the storm; lowest barometer 29.06 (738.1) at 11 a. m., May 1st. Captain Fulcher, commanding s. s. "City of Truro," makes the following report: "May 1st, in N. 58° 21′, W. 26° 42, noon, moderate gale from s., increasing to fresh gale, veering to sw. and moderating at night, then moderate winds and fair weather." At 12 noon (Greenwich mean time) of the 2d the area of lowest pressure had moved northeastward to N. 53°, W. 24°, with fresh to strong gales to the east and northeastward. During the next twenty-four hours the storm-centre moved nne. to N. 60°, W. 18°, passing, during the 3d, beyond the northern limit of reports.

3.—This storm first appeared on the 2d, in N. 36°, W. 47°, with fresh gales to the east and northeastward. On the 3d the centre had moved north of east, to N. 38°, W. 34°, with barometric pressure of about 29.80 (756.9), and fresh gales to the southwestward. The low area then moved northeastward to N. 44°, W. 23°, on the 4th, with an appreciable decrease of energy, the depression being apparently dissipated during this day.

The following reports were made in connection with low pressure number iii, charted as a land depression: S. S. "Dunholm," Captain Wilkinson, by chief officer Wm. Scott: "Left Matanzas May 4th, and had moderate winds and fair weather till May 7th, in N. 33° 23′, W. 76° 20′. At midnight fresh gales from ssw. began, with squally weather and rain, and high confused seas, increasing at 4 a. m. on the 8th, in N. 36° 11′, W. 73° 34′, to strong gale, ssw., accompanied by heavy rain and thunder and lightning, which continued till noon; barometer, 29.75 (755.6), at noon; gale moderated at night. 9th, in N. 38° 55′, W. 70° 53′, strong breeze, sw., and cloudy; veered to nw., and increased at 8 a. m. to strong gale, nw., and moderated at noon; then moderate winds and fair to Boston."

The s. s. "State of Georgia," G. Moody, commanding, encountered a strong sse. gale at 8 p. m., of the 9th, in N. 41° 25′, W. 56° 20′; wind veered from sse. to s., sw., w., and nw. during the 9th and 10th; lowest barometer, 29.64 (752.8), at 9.30 a. m. of the 10th. The s. s. "Sidonian," Capt. B. Jamieson, in N. 42° 30′, W. 63° 40′, had a whole gale on the 9th; wind set in from the se., and veered to s., sw., w., and nw., the wind blowing heaviest from sw., veering to nw.; lowest barometer, 29.43 (747.5), at 4 p. m. of the 9th. The s. s. "Ancoria," J. J. Small, commanding, had a fresh gale, commencing 9 p. m. of 9th and ending 5 a. m. of 10th; wind set in se., veering to s., sw., and w.; lowest barometer, 29.59 (751.6), at 6 a. m., May 10th. Capt. William Bowen, commanding s. s. "Ponca," makes report under date of the 9th: "In N. 40° 31′, W. 60° 32′ (noon), fresh gale began from s., increasing at night to strong gale s.; heavy rain and confused sea; barometer, at 8 a. m., 29.98 (761.5); wind veered to nw. and w. in early a. m. of 10th, in N. 41° 9′, W. 64° 27′, and increased to whole gale n., with clear weather, and continued until night, then moderated; barometer 29.80 (756.9) at 7.45 a. m. 11th, had fresh to strong breezes and thick and rainy weather to port (Boston)." Mr. Tyrrell, chief officer, "City of Truro," Captain Fulcher, commanding, reports: "9th, in N. 45° 28′, W. 58° 55′, fresh gale began from se. at noon, with thick fog, rain, and high sea; veered to sw. and moderated at night; then had moderate winds, rain, and fog at intervals." On the 10th this storm passed northeastward beyond the region of observation, probably continuing across the Atlantic as depression number 6, herein and hereafter described. This storm was cabled to London.

4.—This storm developed over the ocean in N. 36°, W. 55°, and is first charted on the 11th. Vessels to the east and northward reported fresh gales and rain. Following a southerly course, the depression was central on the 12th in N. 32°, W. 55°, after which date it passed beyond the limit of reports to the southeastward. No special reports have been received concerning this storm.

5.—Apparently originating in about N. 40°, W. 61°, during the early morning of the 13th, this depression is traced southeastward to N. 38°, W. 57°, on the morning of the 14th; from thence slightly north of east to N. 39°, W. 48°, by the 15th, during which date it disappeared to the eastward. Rain and fresh winds accompanied this depression, but reports at hand fail to associate noteworthy features in connection with its passage.

6.—It is thought that this storm was a continuation of land depression number iii, described in this REVIEW, which, through an absence of reports, it was not possible to trace beyond the eastern coast of Newfoundland. Appearing at 12 noon (Greenwich mean time) of the 15th, in N. 55°, W. 24°, this storm exhibited pressure about 29.47 (748.5), with moderate gales and rain to the southeastward. On the 16th the depression had moved to N. 57°, W. 17°, with a slight decrease in pressure, strong gales to the southward, and rain on the west coast of Scotland. From this locality it coursed southeastward to N. 54°, W. 14°, by 12 noon (Greenwich mean time) on the 17th, with rapidly decreasing pressure, fresh gales to the southward, and rain and moderate southerly gales along the Irish coasts. During the 17th the depression advanced eastward over the British Isles, beyond the region of marine reports.

7.—This depression appeared off the southern coast of Ireland, in about N. 49° 30′, W. 9° 30′, on the 19th, disappearing over the continent to the eastward on the same date, without developing special features.

8.—This depression is a continuation of low area number ix, traced over the North American continent, and first appears in the Gulf of Saint Lawrence, in N. 49°, W. 61°, on the morning of the 21st, with pressure ranging to 29.57 (751.1), rain and fresh winds to the southeastward. On the morning of the 22d the depression was central to the southeastward of its former position, in N. 47°, W. 56°, with an apparent increase in pressure and moderate to fresh gales and rain to the southeastward. From this location it moved northeastward to N. 50°, W. 53, by the morning of the 23d; from this position passing northeastward beyond the region of observation. No special data has been submitted relative to this storm.

9.—This depression appeared off the southern coast of Ireland on the 26th, with pressure about 29.50 (749.3), rain and moderate winds. During this date the storm moved south of east to N. 50°, W. 6°, on the 27th, with decreasing pressure

and fresh northwest gales off the southeast coast of Ireland. During the 27th the depression advanced eastward beyond the limit of marine observations.

10.—This storm, concerning which reports are meagre, first appeared off the western coast of northern Spain, in about N. 43°, W. 12°. Reports from as far south as N. 36° show fresh easterly gales on this date, and moderate winds and fair weather were reported in N. 49°. The depression pursued a northeasterly course to N. 45°, W. 8°, on the 31st, and apparently developed considerable energy, fresh gales and rain being reported to the northward, and fresh easterly gales to the southward.

OCEAN ICE.

On chart i are also exhibited the eastern and southern limits of the region within which icebergs and field ice have been observed during May, 1886. These limits have been determined from reports furnished by shipmasters, and from trustworthy data published in the "New York Maritime Register" and other newspapers. During this month the easternmost iceberg noted in reports at hand was observed in N. 48° 55′, W. 46° 13′, by the s. s. "Grecian Monarch," R. J. W. Bristow, commanding. The southernmost iceberg was observed in N. 41° 36′, W. 51° 30′. Very heavy bodies of Arctic ice, with numerous icebergs, were encountered all along the Newfoundland and Cape Breton coasts, and off the southeastern edge of the "banks;" in many instances compelling vessels to deviate largely from their course. While the ice-drift in the trans-Atlantic ship routes has been less extensive than it usually is at this period, unusually heavy masses of field ice and icebergs have moved south to dangerous localities, and have floated over the "banks" in formidable numbers and size.

A comparison with the chart with that of the preceding month (April, 1886), shows a contraction of the ice limit to the westward; the eastern limit for May being about six degrees further west than that of the preceding month. The southern limit is about the same as the southern limit for April. As compared with May, 1885, the eastern limit is five degrees further west; the southern limit being about the same.

The following table shows the comparison between May, 1886, and the same month of the three preceding years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Lon. W.	Month.	Lat. N.	Lon. W.
	° ′	° ′		° ′	° ′
May, 1883	40 30	47 00	May, 1883	45 40	45 12
May, 1884	41 30	47 30	May, 1884	43 30	44 50
May, 1885	40 50	48 15	May, 1885	42 30	40 10
May, 1886	41 36	51 30	May, 1886	48 55	46 13

Icebergs and field ice were reported during May, 1886, as follows:

May 1st.—S. S. "Wisconsin," in N. 42° 20′, W. 49° 47′, passed an iceberg; also, passed one in N. 42° 10′, W. 51° 54′, on the same date. The s. s. "City of Truro," in N. 49° 30′, W. 50° 20′, encountered quantities of drift ice. The s. s. "Buenos Ayrean," in N. 42° 20′, W. 52° 12′, passed a piece of ice. The s. s. "Victory," in N. 46° 06°, W. —° —′, cleared the ice. The s. s. "Umbria," in N. 42° 53′, W. 50° 19′, saw a large iceberg, and in N. 42° 42′, W. 52° 14′, passed a small iceberg. The s. s. "Eider," in N. 41° 24′, W. 49° 47′, passed an iceberg of medium size.

2d.—S. S. "State of Nevada," in N. 42° 27′, W. 51° 10′, passed two large icebergs and two small pieces.

3d.—The ship "David Brown," in N. 42° 28′, W. 51° 49′, saw a large iceberg.

4th.—The bark "Orient" passed a large quantity of ice on the southeastern edge of the "banks." The s. s. "Norwegian," in N. 42° 15′, W. 49° 53′, passed a large iceberg. The bark "Cormorin," at the southeastern edge of the "banks," passed an iceberg 100 feet high. The s. s. "Siberian," in N. 47° 47′, W. 49° 14′, passed two large and several small icebergs; in N. 47° 47′, W. 50° 13′ passed a large iceberg with a quantity of detached ice around it; in N. 47° 47′, W. 50° 47′, passed a large iceberg.

5th.—S. S. "Siberian" passed through a very heavy field of ice, extending from Saint John's harbor, Newfoundland, E. ¼ N. 94 miles, dotted throughout with large icebergs. The easternmost limit of the field ice was in N. 47° 47′, W. 50° 47′, and extended as far north and south as the eye could reach.

6th.—S. S. "Adriatic," in N. 41° 43′, W. 51° 21′, passed a small iceberg. The s. s. "The Queen," in N. 41° 36′, W. 51° 30′, passed a large iceberg and two small pieces. The s. s. "City of Truro," in N. 49° 30′, W. 50° 20′, fell in with quantities of drift ice.

7th.—The s. s. "City of Truro," in N. 47° 40′, W. 51° 50′, at 5 a. m., passed a large iceberg and large quantities of drift ice. At 11 a. m., in N. 46° 41′, W. 52° 8′, fell in with large quantities of pack ice, being dangerous and difficult to get through; steamed around field fifty-eight miles to south. The weather was foggy most of the time while passing the ice, only clearing up at intervals; when about thirty miles from Saint John's, Newfoundland, fell in with large patches of field ice and many icebergs.

8th.—The s. s. "City of Truro," in N. 46° 16′, W. 53° 20′, at 3.30 a. m., passed several icebergs, being the last ice passed. Fog clearing at intervals.

8th.—S. S. "Amerique," in N. 41° 27′, W. 50° 53′, passed an iceberg ninety feet high, at 6.30 p. m.

10th.—S. S. "Shakspere," in N. 43° 27′, W. 51° 1′, passed an iceberg.

11th.—S. S. "Polino," in N. 46° 20′, W. 54° 40′, passed fields of ice and numerous icebergs off the southeast coast of Newfoundland and Cape Race, and ice-fields as far up as N. 46° 20′, W. 54° 40′. Passed strings of ice all along the Cape Breton coast and from Flint Island to Saint Paul Island; apparently full of ice between Cape North and Saint Paul. The s. s. "Siberian," after rounding Cape Race, encountered ice, extending as far south as the eye could detect from the masthead, and passed a great many icebergs w. true wsw. off Cape Race, the most westerly one in N. 46° 25′, W. 53° 59′.

12th.—The bark "Magnum" saw hundreds of icebergs north of the "banks," and could see them in every direction as far as the eye could reach.

15th.—S. S. "Corean" encountered an unusual number of icebergs from W. 49° to west of Cape Saint Mary, and quite an accumulation of large bergs about Cape Race on the evening of the 15th.

19th.—S. S. "Nova Scotian," in N. 49° 15′, W. 48° 21′, passed many small icebergs.

20th.—S. S. "Plover," "at Saint John's, Newfoundland, from the extreme north of Newfoundland." "The heaviest body of Arctic ice within its experience, moving rapidly southward in the track of Atlantic Ocean steamers; icebergs, among the floes, could be counted by hundreds." The s. s. "Nova Scotian" arrived at Saint John's, Newfoundland, and reported a field of ice two hundred miles wide, east of Newfoundland, and passed many small icebergs after leaving Saint John's.

23d.—S. S. "Bulgarian," in N. 43° 37′, W. 49° 22′ at 2 a. m., passed two medium-sized icebergs to the northward; also, portions of broken ice. The s. s. "Ontario," in N. 47° 34′, W. 47° 01′, passed four large icebergs, and forty-five miles west of that position passed one large berg. The s. s. "Hekla," in N. 43° 23′, W. 49° 0′, passed three icebergs.

24th.—S. S. "Grecian Monarch," in N. 48° 55, W. 46° 13′, passed an iceberg.

25th.—S. S. "Grecian Monarch," in N. 47° 25′, W. 50° 19′, passed an iceberg, and in N. 47° 16′, W. 50° 40, passed two bergs, one very large.

27th.—S. S. "Umbria," in N. 43° 10′, W. 49° 0′, passed several small pieces of ice.

28th.—S. S. "Buenos Ayrean," in N. 46° 47′, W. 49° 0′, passed an iceberg bearing north.

29th.—S. S. "Buenos Ayrean," in N. 46° 20′, W. 52° 30′, passed close alongside a large iceberg at 8.42 p. m.

30th.—S. S. "Buenos Ayrean," in N. 46° 20′, W. 52° 58′, passed a large iceberg.

31st.—S. S. "Gallia," in N. 42° 54′, W. 50° 05′ at 3.30 p. m., passed a large iceberg.

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York City and Philadelphia, and in the Custom-House, Boston, where the necessary blanks and other information will be furnished to ship-masters.

In pursuance of arrangements made with the Meteorological Office of London, England, there were cabled to that office from New York during May, 1886, nine reports concerning storms and icebergs encountered by vessels in the Atlantic west of the forty-fifth meridian; one message was sent from Boston.

TEMPERATURE OF THE AIR.

[*Expressed in degrees, Fahrenheit.*]

The distribution of mean temperature over the United States and Canada for May, 1886, is exhibited on chart ii by the dotted isothermal lines; and in the tables of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service.

In the following table are given the mean temperatures for the several geographical districts, with the normals and departures, as deduced from Signal Service observations:

Average temperatures for May.

Districts.	Average for May Signal-Service observations.		Comparison of May, 1886, with the average for several years.
	For several years.	For 1886.	
	°	°	°
New England	54.7	54.6	− 0.1
Middle Atlantic States	61.9	60.9	− 1.0
South Atlantic States	69.9	70.1	+ 0.2
Florida Peninsula	76.5	75.8	− 0.7
Eastern Gulf States	72.3	71.4	− 0.9
Western Gulf States	73.0	74.0	+ 1.0
Rio Grande Valley	79.8	77.9	− 1.9
Tennessee	68.6	68.4	− 0.2
Ohio Valley	64.8	65.1	+ 0.3
Lower Lake region	56.8	55.9	− 0.9
Upper Lake region	51.1	51.8	+ 0.7
Extreme Northwest	52.4	55.8	+ 3.4
Upper Mississippi Valley	62.8	64.3	+ 1.5
Missouri Valley	59.9	63.8	+ 3.9
Northern slope	52.5	56.7	+ 4.2
Middle slope	59.3	65.6	+ 6.3
Southern slope	69.6	75.0	+ 5.4
Southern plateau	65.9	69.6	+ 3.7
Middle plateau	55.3	59.1	+ 3.8
Northern plateau	50.5	52.8	+ 2.3
North Pacific coast region	55.3	56.2	+ 0.9
Middle Pacific coast region	62.3	62.2	+ 0.1
South Pacific coast region	66.4	67.6	+ 1.2

On chart iv the departures from the normal temperature are illustrated by lines connecting stations of normal or equal abnormal values.

From this chart will be seen that the temperature for May was below the normal in all districts bodering on the lakes and the Gulf of Mexico; also in New England (except eastern Massachusetts and Connecticut), the middle Atlantic states, and generally in that portion of the country lying between the Alleghany Mountains and the Atlantic Ocean, except a strip of sea-shore extending from Cape Hatteras, North Carolina, to Jacksonville, Florida. The Mississippi Valley and all the country lying to the west, except central California, was above the normal, the excess being most marked in the middle slope, southern slope, and southern plateau, these regions averaging 6° above the normal.

In the districts where the mean temperature was below the normal the departures were generally slight.

The following are some of the most marked departures from the normal temperature at Signal Service stations:

Above normal.		Below normal.	
	°		°
West Las Animas, Colorado	8.4	Brownsville, Texas	3.5
Fort Elliott, Texas	7.2	Grand Haven, Michigan	3.0
Fort Sill, Indian Territory	6.5	Baltimore, Maryland	2.6
Huron, Dakota	6.2	New Orleans, Louisiana	2.4
Fort Apache, Arizona	6.1	Oswego, New York	2.2
Fort Smith, Arkansas	5.5	Washington City	2.1
Deadwood, Dakota	5.5	Mobile, Alabama	2.1
Prescott, Arizona	5.3	Galveston, Texas	1.8

DEVIATIONS FROM NORMAL TEMPERATURES.

In the table below are given, for certain stations, as reported by voluntary observers, the normal temperatures for May for a series of years, the mean temperature for May, 1886, and the departures from the normal:

Station.	County.	Normal temperature for May.	Number of years.	Mean temperature for May, 1886.	Departure.
		°		°	°
Arkansas.					
Lead Hill	Boone	66.1	4	74.4	+ 8.3
California.					
Fall Brook	San Diego	60.9	10	62.0	+ 1.1
Sacramento	Sacramento	64.5	20	66.2	+ 1.7
Connecticut.					
Middletown *	Middlesex	56.9	28	56.7	− 0.2
Thompson *	Windham	56.5	30	55.9	− 0.6
Dakota.					
Webster	Day	55.5	3	62.6	+ 7.1
Illinois.					
Anna	Union	66.6	11	69.8	+ 3.2
Mattoon	Coles	64.3	6	68.0	+ 3.7
Riley	McHenry	56.9	25	57.9	+ 1.0
Sycamore	De Kalb	58.6	6	58.2	− 0.4
Indiana.					
Logansport	Cass	63.8	30	66.6	+ 2.8
Lafayette	Tippecanoe	62.7	7	62.3	− 0.4
Mauzy	Rush	60.4	6	62.0	+ 1.6
Spiceland	Henry	61.6	32	63.8	+ 2.2
Vevay	Switzerland	65.4	21	67.3	+ 1.9
Iowa.					
Cresco	Howard	58.1	10	60.1	+ 2.0
Monticello	Jones	59.7	33	61.1	+ 1.4
Kansas.					
Independence	Montgomery	66.4	15	71.9	+ 5.5
Lawrence	Douglas	65.5	18	68.5	+ 3.0
Wellington	Sumner	64.6	8	67.6	+ 3.0
Yates Center	Woodson	63.2	6	68.9	+ 5.7
Maine.					
Belfast *	Waldo	52.0	27	53.2	+ 1.2
Bridgeton *	Cumberland	53.9	11	53.4	− 0.5
Cornish	York	52.6	29	54.6	+ 2.0
Gardiner	Kennebec	53.4	50	54.0	+ 0.6
Orono *	Penobscot	52.3	18	53.4	+ 1.1
Maryland.					
Fallston	Harford	60.1	15	59.3	− 0.8
Massachusetts.					
Amherst *	Hampshire	56.8	49	58.5	+ 1.7
Cambridge *	Middlesex	56.0	64	56.6	+ 0.6
Fitchburg *	Worcester	55.2	30	56.1	+ 0.9
New Bedford *	Bristol	54.6	74	55.3	+ 0.7
Springfield *	Hampden	58.9	19	60.0	+ 1.1
Somerset	Bristol	58.2	16	59.3	+ 1.1
Taunton *	Bristol	58.6	16	57.3	− 1.3
Williamstown *	Berkshire	56.5	32	56.7	+ 0.2
Nevada.					
Carson City	Ormsby	57.1	7	59.6	+ 2.5
New Brunswick.					
Saint John *	Saint John	47.0	26	48.9	+ 1.9
New Hampshire.					
Concord *	Merrimac	57.8	18	56.0	− 1.8
Hanover *	Grafton	55.5	21	54.7	− 0.8
New York.					
North Volney	Oswego	53.1	19	54.1	+ 1.0
Palermo	Oswego	53.2	33	52.6	− 0.6
Plattsburg Barracks	Clinton	54.6	17	55.2	+ 0.6
Ohio.					
Wauseon	Fulton	58.7	16	60.4	+ 1.7
Westerville	Franklin	59.7	10	61.4	+ 1.7
Pennsylvania.					
Dyberry	Wayne	54.7	20	54.4	− 0.3
South Carolina.					
Stateburg	Sumpter	70.1	6	71.5	+ 1.4
Texas.					
New Ulm	Austin	74.5	14	76.1	+ 1.6
Vermont.					
Lunenburg *	Essex	52.3	38	52.3	0.0
Newport *	Orleans	55.9	12	55.4	− 0.5
Strafford *	Orange	56.2	12	55.7	− 0.5
Virginia.					
Bird's Nest	Northampton	65.0	18	66.8	+ 1.8
Dale Enterprise	Rockingham	61.9	6	67.3	+ 5.4
Variety Mills	Nelson	63.6	9	63.3	− 0.3
West Virginia.					
Helvetia	Randolph	58.1	10	58.4	+ 0.3

* From the "Bulletin of the New England Meteorological Society."

In connection with this subject the following notes are furnished by voluntary observers:

California.—Sacramento: the warmest May during the past twenty years was in 1875; mean temperature, 70°.5. The coldest during the same time was in 1879; mean temperature, 59°.7.

Fall Brook, San Diego county: the highest mean temperature for May during the past ten years was 64°.2, in 1885; lowest, 59°.3, in 1877.

Santa Barbara, Santa Barbara county: the mean temperature of the month was 60°.5; that of the warmest day, the 16th, 65°.5, and the coldest, the 1st, 54°.0. The average daily range of the thermometer was 21°.3; the greatest daily range was 30°.0, on the 16th; the least, 13°.5, on the 2d and 30th.

Illinois.—Riley, McHenry county: the mean temperature of the spring of 1886, 45°.2, is 1°.5 higher than the mean of twenty-five springs past; six springs, 1863, 1871, 1878, 1879, and 1880, were warmer.

Indiana.—Vevay, Switzerland county: the maximum temperatures for May during the past twenty-one years were 98°.0, in 1866; 95°.0, in 1867 and 1868; 94°.0, in 1881; lowest, 35°.0, in 1867; 32°.0, in 1875 and 1876; 30°.0, in 1877. The maximum temperature of May, 1886, 89°.0, corresponds within a fraction of the mean maximum, 89°.6, of twenty-one years. The minimum temperature for this month, 43°.0, is 1°.5 above the mean minimum, 41°.5, of twenty-one years.

Iowa.—Monticello, Jones county: the highest May temperature during the past thirty-three years occurred in 1856, 95°.0; lowest in 1885, 25°.0. The mean temperature for March, April, and May, 1886, 47°.4, is 4°.4 above the mean of the same months in 1885.

Kansas.—Yates Centre, Woodson county: the mean temperature of the spring months of this year, 54°.3, is 2°.3 above the mean spring temperature of the past six years.

Independence, Montgomery county: the mean temperature for the five months ending May 31st, 44.°4, is 2°.0 below the average of the same period for the last fourteen years.

Wellington, Sumner county: the highest mean temperature for May during the past eight years, 71°.2, occurred in 1880; the lowest, 58°.2, in 1882.

Maine.—Cornish, York county: the warmest May during the past twenty-nine years was in 1879; mean temperature, 59°.0.

New York.—Palermo, Oswego county: the warmest May during the past thirty-three years was in 1880; mean temperature being 60°.7; the coldest was in 1867, 47°.5.

North Volney, Oswego county: the highest mean temperature for May during the past nineteen years occurred in 1880, 62°4; lowest in 1882, 50°.2 The mean temperature for this spring is 43°.8; the normal spring temperature for the past nineteen years is 41°.5; the warmest spring during the same period was 1878, 47°.4; coldest spring, 1885, 37°.6.

Ohio.—Westerville, Franklin county: the highest May mean temperature during the past ten years occurred in 1880, 65°.0; the lowest during the same time occurred in 1882, 55°.1.

Wauseon, Fulton county: during the past sixteen years the highest May mean temperature was in 1880, 64°.3; the lowest in 1882, 52°.2; the maximum temperature for May during that time occurred in 1874, 103°.2; minimum in 1885, 21°.0. The mean temperature of the spring of 1886 is 2°.9 above the normal spring temperature.

Texas.—New Ulm, Austin county: the highest mean temperature for May during the past fourteen years occurred in 1879, 77°.4; lowest in 1885, 72°.0; the maximum temperature in that time was 98°.0, in 1874; minimum 46°.0 in 1876. The normal spring temperature of the past fourteen years is 68°.6; temperature of the spring of 1886 is 67°.2, which is 1°.4 below the mean.

Virginia.—Dale Enterprise, Rockingham county: the highest mean temperature for May during the past six years was 69°.8, in 1881; lowest mean 40°.6, in 1883.

Variety Mills, Nelson county: the highest mean temperature for May during the past nine years was 68°.0, in 1880; lowest mean, 60°.2, in 1877. The mean temperature for the spring of 1886 is 53°.9, which is only 0°.1 below the mean of the past nine years; in that time the highest was 57°.5, in 1878, the lowest, 51°.9, in 1885.

RANGES OF TEMPERATURE.

The monthly, and the greatest and least daily, ranges of temperature for the Signal Service stations will be found in the tables of miscellaneous meteorological data. The monthly ranges were greatest in the northern plateau and northern slope, and least along the Pacific coast and in Florida.

The following are some of the greatest and least monthly ranges at Signal Service stations:

Greatest.	°	Least.	°
Poplar River, Montana	70.5	Key West, Florida	21.4
Fort Maginnis, Montana	69.1	San Diego, California	22.3
Winnemucca, Nevada	68.4	Tatoosh Island, Washington Territory	22.6
Fort Custer, Montana	68.1	Fort Canby, Washington Territory	24.8
Fort Benton, Montana	67.1	Galveston, Texas	26.4
Fort Shaw, Montana	67.0	Cedar Keys, Florida	27.6
Boisé City, Idaho	64.8	Cape Hatteras, North Carolina	31.3

FROSTS.

Frosts occurred in the various states and territories during the month on the following dates:

Arizona.—Wilcox, 14th; Prescott, 14th, 15th.

British Columbia.—New Westminster, 3d, 4th.

California.—Fort Bidwell, 1st; Hydesville, 1st, 2d; Murietta, 6th, 7th.

Colorado.—Pike's Peak, 2d; Montrose, 2d, 15th; Fort Lewis, 13th; Denver, 15th.

Connecticut.—North Colebrook and New Haven, 1st, 18th; Bethel, 13th, 17th, 18th.

Dakota.—Webster, 1st, 3d, 4th, 6th, 15th, 16th; Fort Sully, 2d, 4th; Fort Yates, 2d, 3d, 5th; Bismarck, 2d, 4th, 6th, 15th; Fort Totten, 2d, 4th, 15th; Fort Buford, 2d, 12th, 13th, 14th; Deadwood, 2d, 15th, 16th; Fort Pembina, 3d; Huron, 4th, 6th; Yankton, 14th.

Idaho.—Boisé Barracks, 1st, 10th, 14th.

Illinois.—Charleston, 1st, 16th, 17th; Sycamore, 2d, 5th, 7th, 16th, 25th; Geneseo, 7th, 16th; Bloomington, 15th; South Evanston, 15th, 16th; Springfield, 16th; Riley, Sandwick, and Windsor, 16th, 17th.

Indiana.—Spiceland, 8th, 17th, 26th; Lafayette, 16th; La Grange, Greencastle, and Logansport, 16th, 17th; Sunman, 16th, 17th, 26th; Knightstown, 17th, 26th.

Iowa.—Cedar Rapids *a*, 6th, 16th, 17th; Independence and Logan, 7th; Cresco and Bancroft, 7th, 16th; Cedar Rapids *b*, 7th, 16th, 17th; Fort Madison, Oskaloosa, Clinton, Keokuk, and Des Moines, 16th; Monticello, 16th, 17th.

Kansas.—Allison, 14th; Ninnescah and Dodge City, 15th; Independence, 30th.

Maine.—Gardiner, 1st, 2d, 3d, 18th; Cornish, 3d, 18th.

Maryland.—Baltimore, 7th.

Massachusetts.—Taunton, Deerfield, and Boston, 1st; Princeton, 1st, 2d, 3d; Westborough, 1st, 2d, 3d, 18th; Blue Hill Observatory, 1st, 3d; Amherst, 1st, 18th; Milton, 2d.

Michigan.—Escanaba, 2d, 5th to 9th, 15th, 16th, 17th, 25th, 26th; Grand Haven, 3d, 8th, 16th, 17th, 25th, 26th; Marquette, 5th, 8th, 25th; Mackinaw City, 6th, 7th, 17th, 26th; Traverse City, 6th, 24th, 25th; Alpena, 7th, 17th; Hudson, Birmingham, and Detroit, 8th, 17th; Thornville, 8th, 16th, 17th, 26th; Mottville, 16th, 17th, 26th; East Tawas, 16th, 17th, 26th, 27th; Lansing, 17th; Fort Brady, 17th, 26th.

Minnesota.—Moorhead, 2d, 4th, 6th, 14th, 15th, 16th; Saint Vincent, 4th, 6th, 14th, 15th, 16th; Minneapolis, 15th; Saint Paul, 16th.

Montana.—Fort Shaw, 1st, 2d, 4th, 11th, 14th; Fort Assinaboine, 1st, 4th, 11th, 13th, 14th; Poplar River, 2d to 6th, 13th, 14th, 15th; Fort Maginnis, 2d, 3d, 4th, 14th; Helena, 2d, 4th; Fort Benton, 3d, 4th, 13th.

Nebraska.—Hay Springs, 2d, 15th; North Platte, 14th; Valentine, Crete, Stockham, and Fairburg, 15th.

Nevada.—Carson City, 1st, 2d, 4th, 5th, 6th, 10th, 11th, 12th.

New Hampshire.—Nashua, 1st, 3d, 7th; Berlin Mills, 10th, 18th.

New Jersey.—Clayton, 17th, 18th.

New Mexico.—Santa Fé, 15th.

New York.—Mountainville, 1st; North Volney, 1st, 9th, 18th; Albany, 1st, 18th, 26th; Humphrey, 6th, 9th, 16th, 17th, 19th; Buffalo, 6th, 17th; Le Roy, 7th, 17th; Factoryville, 9th, 17th, 21st, 28th; Ithaca, 9th, 18th; Palmyra and Rochester, 17th; Cooperstown and Penn Yan, 17th, 18th.

North Carolina.—Reidsville, 26th.

Ohio.—Wauseon, 2d, 3d, 6th, 8th, 16th, 17th, 18th, 26th; Napoleon, 2d, 8th, 17th; Garrettsville, 3d, 17th, 21st; Cleveland, Hiram, North Lewisburg, Ruggles, West Milton, and Columbus, 17th; Westerville, 17th, 26th.

Oregon.—Albany, Lakeview, and Ashland, 1st; Fort Klamath, 1st, 2d; Eola, 2d.

Pennsylvania.—Dyberry, 1st to 4th, 17th, 18th; Wellsborough, 8th, 9th, 17th, 21st, 29th; Grampian Hills, 9th; Erie, Pittsburg, and East Brook, 17th; Blooming Grove, 18th; Drifton and Philipsburg, 26th.

Tennessee.—Nashville, 1st; Ashwood, 2d.

Vermont.—Lunenburg, 10th; Strafford, Stowe, and Poultney, 18th.

Table of comparative maximum and minimum temperatures for May.

State or Territory.	Station.	For 1886.		Since establishment of station.			
		Max.	Min.	Max.	Year.	Min.	Year.
		°	°	°		°	
Alabama	Mobile	88.9	51.7	98.0	1878	47.3	1883
Do	Montgomery	93.0	49.7	98.0	1875	44.0	1883
Arizona	Prescott	92.1	33.0	90.5	1885	26.0	1877
Do	Fort Apache	96.3	33.0	93.0	1881	29.0	1880, 1883
Arkansas	Fort Smith	97.7	45.0	93.3	1883	41.5	1885
Do	Little Rock	92.3	48.5	91.0	1880	44.0	1883
California	San Francisco	85.8	47.8	86.0	1883	45.0	1876, 1879, 1880, 1882
Do	San Diego	72.3	50.0	94.0	1879	45.4	1883
Colorado	Denver	89.9	35.5	92.0	1874	27.0	1872, 1873
Do	Pike's Peak	47.0	8.0	47.0	1880	— 8.0	1875
Connecticut	New Haven	83.5	32.3	89.0	1880	30.5	1882
Do	New London	83.3	37.6	89.0	1881	32.0	1876, 1882
Dakota	Fort Buford	88.9	29.9	95.0	1880	20.0	1885
Do	Yankton	94.0	38.7	94.0	1880	24.0	1875
Delaware	Cape Henlopen						
Do	Del. Breakwater			89.0	1880	40.0	1880
District of Columbia	Washington City	83.8	43.4	96.0	1880	33.5	1876
Florida	Jacksonville	91.8	55.9	98.5	1878	48.0	1877
Do	Key West	90.9	69.5	93.2	1881	63.0	1877
Georgia	Atlanta	89.6	43.6	91.0	1879	39.5	1883
Do	Savannah	93.0	53.8	98.0	1878	48.0	1877
Idaho	Boisé City	91.2	26.4	88.0	1881	29.0	1878
Do	Lewiston			92.0	1884	35.0	1881
Illinois	Cairo	87.6	48.5	92.0	1874	37.0	1875
Do	Chicago	82.1	39.9	89.0	1874	27.0	1875
Indiana	Indianapolis	87.1	39.1	89.0	1874, 1881	31.0	1877
Indian Territory	Fort Sill	103.5	46.7	97.0	1880	42.0	1885
Iowa	Dubuque			94.0	1874	25.9	1885
Do	Keokuk	86.0	40.1	92.0	1874	29.0	1875
Kansas	Dodge City	94.1	36.8	92.0	1880	13.0	1881
Do	Leavenworth	92.5	43.0	94.0	1874, 1875	31.0	1875
Kentucky	Louisville	88.5	46.2	93.0	1881	36.0	1875, 1876
Louisiana	New Orleans	90.7	57.4	90.0	1874	56.0	1871, 1877
Do	Shreveport	101.2	53.9	101.0	1875	47.0	1876, 1877
Maine	Eastport	67.4	35.4	80.0	1877	29.0	1882
Do	Portland	76.9	36.1	94.0	1880	34.0	1873, 1876
Maryland	Baltimore	87.5	45.2	95.0	1881	34.0	1876
Massachusetts	Boston	85.2	38.1	97.0	1880	31.0	1882
Michigan	Detroit	83.4	39.5	90.5	1881	29.0	1875
Do	Alpena	83.0	31.0	91.0	1874	22.0	1883
Minnesota	Duluth	84.0	41.9	91.0	1874	26.0	1870
Do	Saint Paul	84.3	33.2	94.0	1874	24.0	1875
Mississippi	Vicksburg	93.1	50.9	95.0	1874, 1877	46.0	1877
Missouri	Saint Louis	89.8	46.6	93.0	1874	32.0	1875
Montana	Fort Benton	94.5	27.4	93.0	1875	22.1	1885
Do	Helena	88.8	25.7	79.3	1885	21.9	1885
Nebraska	North Platte	91.6	36.3	94.0	1880	28.0	1885
Do	Omaha	92.9	41.0	92.0	1880	28.0	1875
Nevada	Winnemucca	88.1	19.7	86.4	1885	20.0	1879
New Hampshire	Mount Washington	49.2	18.5	62.0	1879	— 1.4	1885
New Jersey	Atlantic City	74.9	40.5	89.0	77, '80, '81	33.0	1876, 1880
Do	Sandy Hook	86.1	45.5	93.0	1880	33.0	1874
New Mexico	Santa Fé	82.7	34.0	89.0	1872	24.0	1880
New York	Buffalo	76.6	39.0	87.0	1876	29.0	1876
Do	New York City	86.0	42.0	94.0	1880	34.0	1876, 1880
North Carolina	Charlotte	92.0	45.0	94.4	1881	40.5	1883
Do	Wilmington	93.8	47.2	95.0	1878	38.0	1876
Ohio	Cincinnati	85.9	44.5	94.0	1874, 1875	35.0	1883
Do	Cleveland	80.0	36.1	92.0	1879	28.3	1876
Oregon	Portland	88.8	36.0	94.0	1885	33.0	1878
Do	Roseburg	89.2	30.5	88.7	1885	33.0	1880
Pennsylvania	Pittsburg	88.7	40.9	95.0	1881	27.0	1876
Do	Philadelphia	86.2	43.4	96.0	1880	36.0	1880
Rhode Island	Block Island	73.2	42.0	78.3	1881	36.0	1882
South Carolina	Charleston	94.0	49.9	94.0	1878	47.0	1876
Tennessee	Knoxville	88.5	43.9	93.0	1881	37.0	1880
Do	Nashville	91.2	44.7	93.0	1874, 1879	37.0	1877
Texas	Fort Davis	97.7	41.7	101.0	1881	40.0	1880, 1884
Do	Galveston	86.8	60.4	91.0	1875, 1877	54.0	1876
Utah	Salt Lake City	92.5	31.9	91.0	1874	32.0	1880
Virginia	Lynchburg	91.1	45.2	96.0	1881	37.0	1876
Do	Norfolk	87.0	44.7	98.0	1880	38.0	1876
Washington Ter.	Dayton			90.0	1880	30.0	1881
Do	Olympia	83.3	30.0	87.7	1885	30.0	1882
Wisconsin	La Crosse	84.0	39.8	96.0	1874	29.5	1885
Do	Milwaukee	85.8	35.3	90.0	1874	25.0	1875
Wyoming	Cheyenne			88.0	1874	22.0	1884

Virginia.—Wytheville, 8th; Marion, 9th, 19th; Variety Mills and Dale Enterprise, 17th, 26th, Glendower, 26th.

Washington Territory.—Port Angeles, 1st, 2d; Roseburg, 1st, 2d, 30th, 31st; Linkville, 1st 12th; Olympia, and Walla Walla, 3d.

West Virginia.—Parkersburg, 3d, 17th, 24th, 26th; Helvetia, 9th, 17th, 26th; Clarksburg, 17th, 21st, 24th.

Wisconsin.—Neillsville, 1st, 7th, 9th, 16th, 17th, 25th; Fond du Lac, 6th, 15th, 24th; Milwaukee and Manitowoc, 7th, 16th; Evansville, 7th, 16th, 17th, 25th; Embarras, 7th, 16th, 25th, 26th; Madison, 9th, 16th.

The following reports of injury to vegetation by frosts have been reported:

Boisé City, Idaho: on the 1st a very damaging frost occurred, blighting all kinds of vegetation.

Saint Vincent, Minnesota: a sudden fall of temperature during the night of the 5–6th produced a heavy frost. Much injury was done to growing vegetables. The most serious damage occurred on the Dakota side of the river. On the night of the 14–15th a heavy frost did considerable damage to all kinds of early vegetables, and was especially destructive to spring wheat.

Garrettsville, Portage county, Ohio: a frost on the morning of the 17th did considerable injury to vegetation.

ICE.

Ice formed in the various parts of the country during May, as follows:

Arizona.—Wilcox, 14th.
California.—Fort Bidwell, 1st.
Dakota.—Fort Totten, 15th.
Iowa.—Fort Madison, 16th.
Kansas.—Allison, 14th.
Michigan.—Hudson, 7th.
Ohio.—Garrettsville, 17th.
Oregon.—Linkville, 1st.
Wisconsin.—Milwaukee and Neillsville, 16th.

PRECIPITATION.

[*Expressed in inches and hundredths.*]

The distribution of rainfall over the United States and Canada for May, 1886, as determined from the reports of about seven hundred and fifty stations, is exhibited on chart iii.

In the following table are shown, for the several geographical districts, the normal precipitation for May; the average for May, 1886, and the excess or deficiency as compared with the normal:

Average precipitation for May.

Districts.	Average for May, Signal-Service observations.		Comparison of May, 1886, with the average for several years.
	For several years.	For 1886.	
	Inches.	*Inches.*	*Inches.*
New England	3.69	3.49	−0.20
Middle Atlantic States	3.02	6.47	+3.45
South Atlantic States	3.70	4.24	+0.54
Florida Peninsula	3.47	1.13	−2.34
Eastern Gulf States	4.50	3.06	−0.44
Western Gulf States	5.12	1.04	−4.08
Rio Grande Valley	3.52	4.08	+0.56
Tennessee	3.90	3.69	−0.21
Ohio Valley	3.90	4.35	+0.45
Lower lake region	3.30	2.91	−0.39
Upper lake region	3.48	1.93	−1.55
Extreme northwest	2.87	1.83	−1.04
Upper Mississippi Valley	4.25	3.51	−0.74
Missouri Valley	4.72	3.56	−1.16
Northern slope	2.24	1.06	−1.18
Middle slope	4.56	0.73	−3.83
Southern slope	2.73	0.16	−2.57
Southern plateau	0.51	0.04	−0.47
Middle plateau	1.55	0.10	−1.45
Northern plateau	1.50	0.88	−0.62
North Pacific coast region	2.35	1.44	−0.91
Middle Pacific coast region	0.82	0.39	−0.43
South Pacific coast region	0.33	0.02	−0.31

The precipitation for the month has been in excess of the normal in the Ohio Valley and Tennessee, the middle Atlantic states, and in the region adjacent to the Alleghany Mountains; also in parts of the lower lake region and New England. The excess has been most marked in Maryland and Virginia.

In Florida and all the states bordering on the Gulf of Mexico, in the upper lakes, the Mississippi Valley, and all the country westward to the Pacific Ocean, the precipitation has been below the average for May.

The greatest deficiencies occurred in the west Gulf states and Texas, where they varied from three to eight inches and averaged about four inches. Although this region was generally deficient in rainfall during the month, Brownsville, Texas, had an excess of over three inches.

The following are some of the most marked departures from the normal precipitation at Signal Service stations:

Above normal.		Below normal.	
	Inches.		Inches.
Charlotte, North Carolina	7.72	Palestine, Texas	8.14
Washington City	7.62	Fort Supply, Indian Territory	6.19
Norfolk, Virginia	4.76	Fort Reno, Indian Territory	6.01
Sandy Hook, New Jersey	4.49	Fort Elliott, Texas	5.66
Baltimore, Maryland	4.07	Little Rock, Arkansas	5.31
Kitty Hawk, North Carolina	4.00	Shreveport, Louisiana	5.04
Lynchburg, Virginia	3.68	Fort Sill, Indian Territory	5.02

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows, for certain stations, as reported by voluntary observers, the average precipitation for the month of May for a series of years; the precipitation for May, 1886; and the departures from the average:

Station.	County.	Average precipitation for May.	Number of years.	Precipitation for May, 1886.	Departure.
		Inches.		Inches.	Inches.
Arkansas.					
Lead Hill	Boone	7.09	4	2.04	− 5.05
California.					
Fall Brook	San Diego	0.59	10	0.00	− 0.59
Sacramento	Sacramento	0.49	12	0.12	− 0.37
Connecticut.					
Canton *	Hartford	4.58	25	3.31	− 1.27
Hartford	Hartford	3.21	14	3.42	+ 0.21
Middletown *	Middlesex	3.78	26	4.19	+ 0.41
Wallingford *	New Haven	4.28	39	3.72	− 0.56
Dakota.					
Webster	Day	6.17	3	6.22	+ 0.05
Illinois.					
Anna	Union	5.40	11	3.71	− 1.69
Mattoon	Coles	5.12	6	4.98	− 0.14
Riley	McHenry	3.35	25	3.13	− 0.22
Sycamore	De Kalb	4.33	6	4.24	− 0.09
Indiana.					
Lafayette	Tippecanoe	5.37	7	7.08	+ 1.71
Logansport	Cass	3.83	30	5.20	+ 1.37
Mauzy	Rush	4.61	6	3.37	− 1.24
Vevay	Switzerland	3.87	21	4.36	+ 0.49
Iowa.					
Monticello	Jones	3.87	33	4.65	+ 0.78
Kansas.					
Independence	Montgomery	4.47	14	1.11	− 3.36
Lawrence	Douglas	4.24	18	5.72	+ 1.48
Wellington	Sumner	5.12	8	0.88	− 4.24
Yates Centre	Woodson	5.44	6	2.87	− 2.57
Maine.					
Cornish	York	2.97	29	3.71	+ 0.74
Gardiner	Kennebec	3.90	48	3.76	− 0.14
Orono *	Penobscot	3.44	18	4.67	+ 1.23
Maryland.					
Fallston	Harford	2.13	15	8.26	+ 6.13
Massachusetts.					
Amherst *	Hampshire	3.92	51	3.32	− 0.60
Cambridge *	Middlesex	3.61	45	3.19	− 0.42
Chestnut Hill *	Middlesex	2.93	11	3.41	+ 0.48
Framingham *	Middlesex	3.03	12	2.98	− 0.05
Lake Cochituate *	Middlesex	3.96	35	2.97	− 0.99
Lynn *	Essex	3.03	12	3.25	+ 0.22
Mystic Lake *	Middlesex	2.89	11	3.13	+ 0.24
New Bedford *	Bristol	3.96	73	4.39	+ 0.43
Somerset	Bristol	3.29	16	4.19	+ 0.90
Springfield *	Hampden	4.22	39	3.30	− 0.92
Taunton *	Bristol	2.55	11	4.32	+ 1.77
Waltham *	Middlesex	3.57	62	3.18	− 0.39
Williamstown *	Berkshire	2.98	19	4.77	+ 1.79
New Brunswick.					
Saint John *	Saint John	4.43	26	5.20	+ 0.77
New Hampshire.					
Concord *	Merrimac	3.07	31	2.22	− 0.85
Hanover *	Grafton	2.56	20	2.55	− 0.01
Nevada					
Carson City	Ormsby	0.29	7	0.26	− 0.03
New York.					
Palermo	Oswego	2.67	33	1.07	− 1.60
Plattsburg Barracks	Clinton	2.00	17	1.48	− 0.52
Ohio.					
Wauseon	Fulton	4.10	14	2.69	− 1.41
Westerville	Franklin	3.62	11	4.75	+ 1.13
Pennsylvania.					
Dyberry	Wayne	3.19	7	4.41	+ 1.22
South Carolina.					
Stateburg	Sumpter	3.13	6	3.13	0.00
Texas.					
New Ulm	Austin	5.85	14	0.05	− 5.80
Vermont.					
Lunenburg *	Essex	3.58	39	2.37	− 1.21
Newport *	Orleans	3.99	12	4.57	+ 0.58
Strafford *	Orange	3.08	12	2.90	− 0.18
Virginia.					
Bird's Nest	Northampton	3.12	18	7.70	+ 4.58
Dale Enterprise	Rockingham	3.76	6	12.66	+ 8.90
Variety Mills	Nelson	3.31	7	8.22	+ 4.91
West Virginia.					
Helvetia	Randolph	4.34	10	7.08	+ 2.74

* From the "Bulletin of the New England Meteorological Society."

The following notes in connection with this subject are furnished by voluntary observers:

California.—Sacramento, Sacramento county: the largest rainfall in May during the last twelve years was 2.90, in 1883; no rain fell during the month of May. 1885.

Fall Brook, San Diego county: the greatest rainfall for May in the past ten years was 1.87 in 1883.

Illinois.—Riley, McHenry county: the total precipitation for the spring of 1886, 10.57, is 1.98 more than the mean of twenty-five preceding springs; only three springs, 1861, 1868, and 1882, had more precipitation.

Indiana.—Mauzy, Rush county: the maximum May rainfall during the past six years occurred in 1882, 8.00; minimum in 1885, 2.00.

Vevay, Switzerland county: the greatest precipitation in any May during the past twenty-one years was 11.80, in 1865; least, 0.52, in 1874.

Iowa.—Monticello, Jones county: the greatest May rainfall during the past thirty-three years occurred in 1858, 7.97; least in 1874, 0.76.

Kansas.—Independence, Montgomery county: during the past fourteen years the rainfall for May has been less than that (1.11) of this month, but twice, viz., 0.88 in 1874, and 0.98 in 1879. The rainfall for the five months ending May 31st, 10.83, is 4.16 below the average for the last thirteen years.

Yates Centre, Woodson county: the rainfall for the spring months, 6.40, is 2.63 below the mean of the past six years.

New York.—Palermo, Oswego county: the greatest May rainfall during the past thirty-three years was in 1864, 6.50; least in 1870, 0.30.

Ohio.—Westerville, Franklin county: the greatest May rainfall during the last eleven years occurred in 1882, 8.43; least in 1879, 1.65.

Wauseon, Fulton county: the greatest rainfall for any May during the last fourteen years was in 1880, 6.25; least in 1877, 1.14. The total precipitation of this spring, 7.44, is 2.33 below the normal.

South Carolina.—Camden (near Kirkwood), Kershaw county: the rainfall for the month is greater than that of any May in the last twenty years, and is more than double the average for the same period.

Texas.—New Ulm, Austin county: the largest rainfall in any May during the last fourteen years was in 1884, 15.25; least in 1886, 0.05. The normal spring precipitation of the past fourteen years is 5.10; the total precipitation for the spring of 1886, 2.27, is 2.83 below the normal.

Virginia.—Dale Enterprise, Rockingham county: more rain fell in this month than has fallen in any May during the past six years; the least May rainfall was 1.74, in 1881.

Variety Mills, Nelson county: the rainfall for this month, 8.22, exceeds that of any month during the past seven years except October, 1885, when it was 10.76, and March, 1884, when it was 8.78.

SNOW.

The dates on which snow fell in the various states and territories are as follows:

***Colorado.*—Fort Lewis, 13th; Pike's Peak, 14th to 17th, 19th, 20th, 26th, 28th.**

***Dakota.*—Bismarck, Fort Buford, and Deadwood, 1st.**

***Kansas.*—West Leavenworth, 2d, 3d.**

***Michigan.*—Marquette, 6th; Thornville, 15th; Mackinaw City, 16th.**

***Minnesota.*—Saint Vincent, 14th.**

***Montana.*—Fort Missoula and Poplar River, 1st; Fort Ellis, and Fort Maginnis, 1st, 12th, 13th; Helena, 1st, 13th; Fort Assinaboine, 10th, 12th, 13th.**

***New Hampshire.*—Mount Washington, 2d, 4th, 8th, 11th, 16th, 25th, 26th, 27th.**

***Oregon.*—Lakeview, 8th, 9th, 10th.**

MONTHLY SNOWFALLS.

[*Expressed in inches and tenths.*]

Monthly snowfalls of one inch or more were reported from the various states and territories during the month, as follows:

***Colorado.*—Pike's Peak, 3.3.**

***Dakota.*—Fort Buford, 5; Fort Sully, 3.**

***Montana.*—Poplar River, 1.6.**

***New Hampshire.*—Mount Washington, 12.4.**

SNOW ON GROUND AT END OF MONTH.

The only station reporting snow on the ground at the end of the month was Pike's Peak, Colorado, where snow remained to a depth of six inches.

HAIL.

Hail storms have been reported as follows:

Osage City, Osage county, Kansas: a heavy rain and hail storm occurred in this part of Kansas on the 6th. It continued thirty minutes, covering the ground with hail several inches deep. Eighty per cent. of the exposed window-glass on the north side of the dwellings was broken. The rainfall was very heavy, flooding the country and doing considerable damage to growing crops.

Florence, Morgan county, Missouri: a hail storm in the vicinity of this place did great damage to property on the 6th. Fruit trees and growing crops were beaten down by the hail, which was succeeded by heavy rain.

Louisville, Kentucky: a thunder-storm, with hail, passed north of the city on the afternoon of the 6th. Hail, the size of marbles fell, breaking numerous windows and sky-lights; gardens and farm crops also suffered from the effects of the hail.

Memphis, Tennessee: at Fitzgibbon's Grove, a station a few miles from the city, on the Louisville and Nashville railroad, a heavy hail storm occurred on the afternoon of the 6th. The hail, which was the size of quail-eggs, is reported to have drifted in places ten inches deep. Vegetation of all kinds was damaged, trees being left entirely stripped of leaves.

Protem, Taney county, Missouri: a severe hail storm is reported to have occurred in Ozark and Douglas counties, Missouri, on the afternoon of the 6th; the stones were of unusual size and penetrated common board roofs.

Variety Mills, Nelson county, Virginia: the voluntary observer at this place reports, concerning hail storms which occurred this month, as follows:

> The violent and destructive hail storms of May, 1886, deserve special mention. By far the worst occurred on the 11th, about 6 p. m. Its effects began not far from the northern extremity of Nelson county; the storm travelled towards the southeast. Width of hail storm, from two to three miles. In this belt forests were stripped of their foliage till the trees were almost or quite bare. Hail fell as large as pullets' eggs and of a jagged and irregular shape. Clover, nearly ready to cut, was beaten to pieces, and the wheat crop entirely destroyed. Two vineyards, several miles apart, lost their entire crops, the owner of one estimating his loss at $4,000. Some consider that $75,000 will not cover the loss for the county. The hills remained whitened with hail for many hours after the storm. Some drifts were said to be many feet in thickness.
>
> Another hail storm, following nearly the same track, occurred on the 23d, about 2 p. m. The hailstones were of smaller size, and not much damage resulted.

Bonne Terre, Saint Francois county, Missouri: a heavy rain andh ail storm passed over this part of the country on the afternoon of the 11th. Hailstones fell in great numbers and of large size, many being the size of goose eggs. The Saint Joseph Works boiler house was riddled. Great damage was done to crops.

Terre Haute, Vigo county, Indiana: a severe wind and hail storm occurred at this place on the afternoon of the 12th. Many windows in houses and street cars were broken. A number of trees and small houses were blown down; the storm was general in the adjacent country. Garden vegetation was destroyed and field crops injured.

Yankton, Dakota: hail fell in considerable quantities on the afternoon of the 12th, during the prevalence of a thunder-storm. The hail varied in size from one-quarter to three-quarters of an inch in diameter. Some of the stones were composed of a nucleus of snow surrounded by a film of ice; others were oblong in shape, having compact snow in one end and solid ice in the other. Some slight damage was done to windows and plants.

Cincinnati, Ohio: at 6.40 a. m. of the 12th, during a heavy thunder storm, hail fell nine-tenths of an inch in diameter.

Forest, Clinton county, Indiana: a hail storm occurred at this place on the 12th. The hailstones were reported to have been nine ounces in weight and twelve inches in circumference. Great damage was done to growing crops and to the windows of stores and dwellings.

Rockford, Winnebago county, Illinois: on the 12th, at 5.30 p. m., large hailstones, two to three inches in diameter, fell. The hail storm continued fifteen minutes.

Charleston, Illinois, 12th: five miles north of this place wind and hail did considerable damage to property. The hailstones were the size of marbles and fell in large quantities.

Reidsville, Rockingham county, North Carolina: on the 12th a thunder-storm, accompanied by high wind and destructive hail, occurred at this place. The hailstones covered the ground to a depth of four inches some of them being as large as hen's eggs. All of the windows in fifteen tobacco factories and in most of the dwellings were broken. Many trees and houses were thrown down by the wind.

Terra Haute, Vigo county, Indiana: on the 23d a disastrous hail-storm occurred at this place and over the surrounding country. In this county alone it is estimated that the number of acres of wheat injured or completely destroyed by hail will reach $5,000. The damage to fruit is still more serious, one vineyard being injured to the extent of $2,500. In Washington township, north of Plainfield, it is reported that the hailstones were three inches in diameter, and covered the ground to a depth of one foot. Large numbers of sheep and hogs were killed. Farmers state that wheat, which was just heading out, was totally ruined. The growing corn was badly damaged, and in some instances farmers will have their whole crop to plant over. Apple, pear, and cherry trees were stripped of their fruit, and gardens were completely ruined.

Danville, Hendricks county, Indiana: a wind and hail-storm passed over this county on the afternoon of the 23d, doing much damage. Hailstones, measuring two inches in diameter, fell to the depth of six inches. Many houses had all windows broken by hail. The greatest damage was to the growing wheat crop, then in full head, it having been wholly destroyed along the track of the storm.

Columbus, Ohio: a very heavy thunder-storm, accompanied by hail, began at 7.03 p. m. of the 24th. Hailstones, the size of cherries, fell at intervals during the storm, damaging gardens and farm crops on the outskirts of the city.

Findlay, Hancock county, Ohio: on the night of the 24–25th a heavy wind and hail-storm passed over this county, doing great damage to wheat and fruit. Some places in the country the hailstones covered the ground and were as large as hen's eggs. Limbs were torn from trees and small fruits were entirely destroyed. The storm was accompanied by heavy thunder and vivid flashes of lightning.

Millersburg, Holmes county, Ohio: a violent and destructive hail storm visited this place shortly before midnight of the 24th. The storm came from the northwest and continued one hour. Hailstones as large as bird's eggs were piled in corners, and the damage to grapes and other fruits was serious. The storm was accompanied by heavy thunder and sharp lightning.

Tiffin, Ohio, was visited by a severe hail and wind storm about 4 p. m. of the 24th, which did much damage to growing fruit and crops.

Anna, Union county, Illinois, was visited by a hail storm at 5.30 p. m. of the 27th. The storm came from the west very suddenly after a sultry day. Hailstones as large as eggs were reported to have fallen, being driven in a slanting direction by the high wind which accompanied the storm. Public school buildings, churches, and almost every dwelling in town had a large proportion of exposed window glass shattered. Wheat, corn, and growing crops generally suffered severely from the hail.

Wytheville, Wythe county, Virginia: on the 27th a thunder-storm, attended by high wind and destructive hail, occurred at this place. The hail was particularly disastrous to wheat.

Hail was also reported to have fallen in the various states and territories during the month, as follows:

Arkansas.—Little Rock, 9th; Fort Smith, 14th, 23d.

California.—Fort Bidwell, 8th.

Colorado.—Montrose and Pike's Peak, 31st.

Dakota.—Webster, 3d, 12th; Fort Abraham Lincoln, 8th; Huron, 8th, 16th; Fort Sully, 12th; Yankton, 14th, 25th; Fort Buford, 27th.

Georgia.—Milledgeville, 15th.

Idaho.—Cœur d'Alene, 9th, 11th.

Illinois.—Anna, 5th, 11th, 27th; Sandwich, 8th, 12th; Chicago, 9th, 12th, 15th; Windsor, 10th, 12th, 14th, 20th; Rockford, Mattoon, and Charleston, 12th; Riley, 12th, 15th; Geneseo, 22d.

Table of excessive and greatest monthly precipitation for May, 1886.

Station.	Specially heavy.		Largest monthly.
	Date.	Amt.	Amount.
Alabama.			
Roanoke	18	4.05	7.97
Scottsborough	6, 7	2.97	
Opelika	18, 19	2.09	
Calera	18	2.20	
Livingston	18, 19	2.48	
Birmingham	19	2.06	
Auburn	18, 19	2.04	
Carrollton	18, 19	2.65	
Florence	5, 6	2.02	
Do	19, 20	2.47	
Gadsden	18, 19	2.75	
Lineville	18	2.20	
Univerity of Ala	18, 19	2.10	
Tuscumbia	6, 7	2.10	
Dakota.			
Webster	7, 8	2.08	6.22
Yankton	12	2.08	
Dist. of Columbia.			
Washington City	7, 8	4.49	10.60
Distrib'g Res'voir	8, 9	3.55	9.75
Do	23	3.04	
Kendall Green	7, 8	4.12	9.20
Receiving Res'voir	8	2.40	8.56
Do	23	2.03	
Florida.			
Live Oak	18, 19	3.82	
Georgia.			
Mossy Creek			9.81
Marietta			9.81
Rabun Gap			8.90
Gainesville a			8.05
Toccoa	18, 19	5.21	7.62
Athens a	18, 19, 20	5.85	7.44
Gainesville b	18, 19	4.20	7.25
Dahlonega			6.92
Athens b	18, 19, 20	5.43	6.84
Augusta	18, 19	4.76	6.29
Atlanta	18, 19	4.76	6.21
Camak	19, 20	3.92	
Washington	18, 19, 20	3.70	
Jessup	19, 20	2.98	
Smithville	18, 19	2.03	
Millen	19, 20	2.08	
Waycross	18, 19, 20	3.14	
Savannah	30, 31	3.42	
Alapaha	19, 20	3.41	
West Point	18, 19	3.00	
Griffin	18, 19	4.54	
Newnan	18, 19	3.40	
Forsyth	18, 19	3.41	
Indiana.			
Lafayette	12, 13	2.54	7.08
Sunman	10, 11, 12	3.19	6.09
Spiceland	12	2.40	
La Grange	13, 14	2.00	
Logansport	14, 15	2.15	
Iowa.			
Oskaloosa	3, 4	2.44	
Independence	9, 10	2.00	
Monticello	8, 9	2.45	
Kansas.			
West Leavenworth	11	2.70	10.80
Do	13, 14	3.00	
Fort Scott	6	5.00	6.20
Wyandotte	11	2.62	
Maryland.			
Falleton	7, 8	4.76	8.26
Great Falls	8, 9	2.00	7.77
Do	23	2.20	
Woodstock	7, 8	4.00	7.36
Baltimore	6, 7, 8	4.17	7.07
Fort McHenry	7, 8	3.80	6.86
McDonogh	7, 8	3.13	
Massachusetts.			
Williamstown	8	2.16	
Michigan.			
Kalamazoo	9, 10	2.27	
Thornville	14, 15	2.08	
Mississippi.			
Edwards	18, 19	2.12	
Waynesborough	18, 19	2.60	
Missouri.			
Springfield	5, 6	6.20	9.30
Do	29, 30	2.00	
Saint Louis	6	2.10	7.84
Do	14	3.33	
Pleasant Hill			6.65
Sedalia			6.51
Chamois			6.23
Steelville			6.20
Lamar	5, 6	2.41	
Warrensburg	11	2.30	
Nebraska.			
Marquette			6.27
New Jersey.			
Egg Harbor City	7, 8	3.45	
Do	19, 20	2.06	15.07
Do	24	4.50	

Station.	Specially heavy.		Largest monthly.
	Date.	Amt.	Amount.
New Jersey—Con.			
Sandy Hook	8	3.30	8.46
Do	13, 14	2.00	
Beverly	7, 8	4.16	8.08
Moorestown			6.80
Phillipsburg	7, 8	2.87	6.24
Upper Montclair	8	2.32	6.20
Dover	8	3.08	6.07
Roseland			6.01
Princeton	7, 8	2.42	
Paterson	7, 8	2.66	
New York.			
New York City	8	2.66	6.53
Do	12, 13	2.80	
White Plains	7, 8	2.33	
Mountainville	7, 8	2.10	
North Carolina.			
Salisbury	18, 19, 20	9.43	13.06
Lincolnton	18, 19, 20	8.30	11.96
Charlotte	18, 19, 20	8.25	11.04
Flat Rock	18, 19	3.68	9.47
Statesville	18, 19 20	5.65	8.91
Kitty Hawk	1, 2	4.25	7.27
Reidsville	19, 20	3.70	6.57
Lenoir	18, 19, 20	3.30	6.20
Wash Woods			6.00
Goldsborough	31	2.24	
Ohio.			
College Hill	11, 12, 13	5.75	8.25
Columbus	12, 13	2.47	7.07
North Lewisburg	12, 13, 14	4.05	7.55
Jacksonborough			6.40
Yellow Springs	12, 13, 14	4.32	6.27
West Milton	11, 12	4.50	6.00
Cincinnati	11, 12	2. 6	
Pennsylvania.			
Drifton	7, 8	3.95	8.60
Catawissa	7, 8	2.98	7.19
Do	12, 13	2.19	
Easton	7, 8	3.08	7.14
West Chester	7, 8	3.71	7.00
Quakertown	5, 6, 7	3.75	6.66
Zionsville	7, 8	3.00	
Dyberry	7, 8	2.50	
Bethlehem	7, 8	2.83	
Blooming Grove	7, 8	3.40	
South Carolina.			
Spartanburg a	18, 19, 20	9.40	13.60
Pacolet	17 to 20	11.98	13.23
Spartanburg b	18, 19, 20	8.67	11.99
Anderson	19, 20	8.22	10.39
Columbia	19, 20	7.41	9.41
Greenville	18, 19, 20	5.87	8.36
Greenwood	18, 19, 20	6.96	8.28
Chester	18, 19, 20	4.30	7.08
Allendale	20	2.41	
Batesburg	19, 20	3.05	
Blackville	20	2.84	
Saint Georges	20	2.00	
Branchville	20	2.05	
Cheraw	20	2.03	
Florence	20	2.24	
Kirkwood	20	3.88	
Stateburg	20	2.87	
Tennessee.			
Brownsville	5, 6, 7	6.63	8.52
Greeneville	28	6.80	7.80
Caryville	5, 6, 7	3.15	7.72
Bolivar	5, 6, 7	3.56	7.56
Do	19, 20	3.50	
Savannah	5, 6, 7	4.80	7.14
Covington a	6, 7	3.4	7.05
Andersonville	5, 6	2.02	6.06
Chattanooga	6, 7	2.68	
Fostoria	18, 19	2.50	
Cookville	5, 6	2.30	
Trenton	6, 7	2.17	
Covington b	7, 8	3.65	
Texas.			
Brownsville	3	3.48	6.57
Do	16, 17	2.94	
San Antonio	2	2.30	
Vermont.			
Newport	25, 26	2.11	
Virginia.			
Dale Enterprise	7, 8	4.04	12.66
Do	13, 14	2.94	
University of Va	7, 8	3.32	9.66
Accotink	7, 8	3.30	8.72
Bruington	31	2.15	8.64
Norfolk	1, 2	3.42	8.32
Variety Mills	6, 7	3.49	8.22
Bird's Nest	31	2.35	7.70
Cape Henry	1	2.26	7.25
Lynchburg	7, 8	2.76	6.74
Chincoteague			6.18
West Virginia.			
Helvetia	7	2.12	7.08
Parkersbutg	13	2.13	

Indiana.—Jeffersonville, 6th, 10th; Sunman and Knightstown, 10th; Spiceland, 12th; Logansport, 12th, 14th; Vevay, 12th, 23d; Indianapolis and La Grange, 23d.

Indian Territory.—Fort Reno, 14th.

Iowa.—Des Moines, 3d; Bancroft, 8th, 10th, 21st; Monticello, 8th, 12th; Logan and Independence, 8th, 12th, 22d; Keokuk and Clinton, 9th; Cresco, 15th; Oskaloosa, 16th.

Kansas.—Allison, 1st, 6th; Manhattan, 4th; Salina, 4th, 6th, 28th; Wakefield, 4th, 11th, 13th, 14th; Yates Centre and Fort Scott, 6th; Concordia and Lawrence, 11th; Wyandotte, 11th, 23d; Leavenworth and West Leavenworth, 13th; Independence and El Dorado, 14th; Ottawa, 23d.

Kentucky.—Frankfort, 13th; Richmond, 13th, 23d; Louisville, 23d.

Maine.—Kent's Hill, 30th.

Maryland.—Fort McHenry, 6th.

Michigan.—Thornville and Traverse City, 26th.

Missouri.—Conception, 3d, 8th; Warrenton, 5th; Springfield, 5th, 6th, 23d, 30th; Lamar, 6th, 14th; Saint Louis, 14th.

Montana.—Fort Benton, 1st; Fort Assinaboine, 1st, 6th; Helena, 7th, 8th; Fort Missoula, 10th; Fort Shaw, 10th 12th; Poplar River, 11th; Fort Ellis, 12th, 13th; Fort Maginnis, 13th.

Nebraska.—North Platte, 1st; Omaha, 3d, 9th; Genoa, 9th; Crete, 9th, 22d; Marquette, 12th; Fort Sidney, 27th, 29th.

Nevada.—Carson City, 30th.

New Hampshire.—Woodstock, 20th.

New Jersey.—Beverly, 27th.

New Mexico.—Fort Union, 24th.

New York.—Albany, 22d, 30th; Ithaca and Humphrey, 25th; Mountainville, 26th.

North Carolina.—Reidsville, 12th; Flat Rock, 24th.

Ohio.—College Hill, 6th, 13th; Columbus, 10th; Cincinnati and Yellow Springs, 12th; Jacksonborough, 12th, 22d; Toledo, 23d, Westerville, Tiffin, Napoleon, and Fostoria, 24th.

Oregon.—Linkville and Pendleton, 8th.

Pennsylvania.—Grampian Hills, 10th; Drifton, 11th, 16th, 20th, 22d; Dyberry, 16th; Quakertown, 20th; Philipsburg, 23d; Pittsburg, 24th; Zionsville, 26th.

South Carolina.—Spartansburg, 6th, 22d, 24th, 28th.

Tennessee.—Austin, 6th; Knoxville, 10th, 24th; Paris, 14th; Nashville, 21st.

Texas.—Abilene, 1st.

Virginia.—Bird's Nest, 6th; Dale Enterprise, 6th, 11th; Variety Mills, 7th, 11th, 24th; Wytheville, 17th.

Washington Territory.—Fort Spokane, 8th; Bainbridge Island, 8th, 27th; Neah Bay, 14th; Tatoosh Island, 15th.

West Virginia.—Clarksburg, 12th.

Wisconsin.—Milwaukee, Evansville, and Fond du Lac, 15th.

SLEET.

Pike's Peak, Colorado, 13th, 21st, 28th.
Mount Washington, New Hampshire, 3d.

COTTON REGION REPORTS.

A system of temperature and rainfall observations was begun in the spring of 1882 in the cotton growing districts of the South. These observations have been continued since in each year from April to October, inclusive. This year the observations were not resumed until April 10th.

In the following table are given the average rainfall and the means of the maximum and minimum temperatures for the several districts, as shown on the chart issued with the REVIEW for April, 1882. For the purpose of comparison the averages for these districts during the four preceding years are also given. A comparison of these figures shows a great deficiency of rainfall in the districts of Galveston, Little Rock, New Orleans and Vicksburg, while in the districts of Atlanta and Augusta a marked excess occurs. The means of the maximum and minimum temperatures are higher than the normal in nearly all the districts, but the departures are slight, except in the districts of Little Rock and Galveston, where the means of the maximum temperature for May, 1886, exceeded the normal by more than 4°; and the means of the minimum temperatures exceeded the normal by 2°.5 for the district of Galveston, and by 4°.7 for the district of Little Rock:

Temperature and rainfall data for the cotton districts, May, 1886.

Districts.	Rainfall.			Temperature.							
				Maximum.			Minimum.			Extremes for May, 1886.	
	Average for May of four preceding years.	Average for May, 1886.	Departures.	Mean for May of four preceding years.	Mean for May, 1886.	Departures.	Mean for May of four preceding years.	Mean for May, 1886.	Departures.	Max.	Min.
	Inch.	Inch.	Inch.	°	°	°	°	°	°	°	°
New Orleans	5.46	1.11	— 4.35	83.7	86.6	+ 2.9	62.6	65.2	+ 2.6	104	47
Savannah	3.12	2.89	— 0.23	85.5	86.8	+ 1.3	62.0	62.8	+ 0.8	99	44
Charleston	3.46	1.98	— 1.48	83.2	84.9	+ 1.7	59.5	58.9	— 0.6	98	40
Atlanta	3.02	5.95	+ 2.93	81.0	81.8	+ 0.8	56.4	58.3	+ 1.9	98	41
Wilmington	3.71	4.94	+ 1.23	79.2	83.1	+ 3.9	56.1	59.0	+ 2.9	98	40
Memphis	4.69	3.49	— 1.20	83.8	82.4	— 1.4	56.4	57.7	+ 1.3	97	30
Galveston	6.53	0.26	— 6.27	83.8	87.9	+ 4.1	62.2	64.7	+ 2.5	101	48
Vicksburg	5.79	1.87	— 3.92	82.0	84.7	+ 2.7	60.3	62 0	+ 1.7	97	41
Montgomery	3.23	3.36	+ 0.13	83.5	84.4	+ 0.9	58.7	59.3	+ 0.6	97	39
Augusta	3.17	5.42	+ 2.25	83.3	84.1	+ 0.8	58.8	60.1	+ 1.3	97	42
Little Rock	5.85	0.80	— 5.05	79.8	85.5	+ 5.7	55.3	60.0	+ 4.7	99	41
Mobile	3.96	2.47	— 1.49	83.3	85.1	+ 1.8	60.1	58.8	— 1.3	99	43

TEMPERATURE OF WATER.

The following table shows the highest and lowest temperatures of water observed at the several stations; the monthly ranges of water temperature; the average depth at which the observations were made; and the mean temperature of the air:

Temperature of water for May, 1886.

Station.	Temperature at bottom.		Range.	Average depth, feet and tenths.	Mean temperature of the air at station.
	Max.	Min.			
	°	°	°		°
Atlantic City, New Jersey	59.1	48.8	9.3	10.2	57.0
Alpena, Michigan	60.7	48.8	11.9	12.7	49.6
Augusta, Georgia	78.2	65.0	13.2	12.4	72.2
Baltimore, Maryland	66.3	52.6	13.7	11.0	61.9
Block Island, Rhode Island	55.2	46.2	9.0	8.5	53.5
Boston, Massachusetts	57.7	52.0	5.7	19.6	56.2
Buffalo, New York	57.4	46.6	10.8	10.1	53.1
Canby, Fort, Washington Territory	59.0	50.4	8.6	16.1	52.1
Cedar Keys, Florida	79.9	73.7	6.2	8.2	74.0
Charleston, South Carolina	77.5	67.6	9.9	38.2	72.8
Chicago, Illinois	64.4	46.0	18.4	8.5	57.0
Chincoteague, Virginia	71.5	53.9	17.6	3.6	59.6
Cleveland, Ohio *	63.4	48.3	15.1	14.0	57.4
Detroit, Michigan	58.1	46.8	11.3	26.9	58.4
Duluth, Minnesota †	39.9	36.1	3.8	10.9	52.2
Eastport, Maine	43.0	38.4	4.6	16.2	47.0
Escanaba, Michigan	56.9	42.0	14.9	18.4	50.0
Galveston, Texas	84.6	70.0	14.6	12.9	74.6
Grand Haven, Michigan	68.6	58.5	10.1	19.0	52.3
Indianola, Texas ‡					
Jacksonville, Florida	82.7	74.5	8.2	18.0	75.8
Key West, Florida	86.5	76.5	10.0	17.6	78.9
Mackinaw City, Michigan	50.1	39.0	11.1	10.0	49.9
Macon, Fort, North Carolina §	70.0	59.0	11.0	11.1	68.1
Marquette, Michigan	54.1	37.5	16.6	11.6	49.4
Milwaukee, Wisconsin	58.0	40.5	11.5	8.0	54.3
Mobile, Alabama	79.0	67.7	11.3	17.6	72.2
New Haven, Connecticut	61.0	51.0	10.0	16.8	56.6
New London, Connecticut	66.6	45.6	21.0	13.0	56.8
New York City	60.0	53.0	7.0	17.0	58.5
Norfolk, Virginia	71.2	56.0	15.2	16.4	65.0
Pensacola, Florida	76.9	69.1	7.8	17.5	73.8
Portland, Maine	52.7	43.3	9.4	16.2	53.1
Portland, Oregon	64.6	52.4	12.2	52.9	57.7
Sandusky, Ohio	69.2	57.4	11.8	11.3	59.5
Sandy Hook, New Jersey	64.3	50.0	14.3	11.8	57.9
San Francisco, California	62.3	56.5	5.8	37.3	57.8
Savannah, Georgia	77.2	68.0	9.2	10.0	75.0
Smithville, North Carolina	78.1	63.1	15.0	11.0	70.2
Toledo, Ohio	72.2	60.1	12.1	13.3	52.7
Wilmington, North Carolina	74.5	64.9	9.6	10.0	70.2

* Record for 30 days; lake too rough to take observation on the 7th. † Frozen first four days of month. Observations interrupted by ice in bay 7th to 10th, 12th, 13th, 15th, 20th, 21st. ‡ Observations temporarily suspended. § Record for the first 20 days.

WINDS.

The most frequent directions of the wind during May, 1886, are shown on chart ii by the arrows flying with the wind; they are also given in the tables of miscellaneous meteorological data. In the lower lake region, the south Atlantic and east Gulf states, the prevailing direction of the wind is from the southwest, in the west Gulf states and Texas it is from the south and southeast. In the Extreme Northwest and the Upper Mississippi Valley the winds are generally from the north and northwest; in other districts they are variable.

HIGH WINDS.

[*In miles per hour.*]

Wind-velocities of fifty or more miles per hour were reported during the month as follows:

Mount Washington, New Hampshire, 59, nw., 4th; 80, w., 5th; 54, w., 9th; 60, w., 10th; 58, se. and e., 11th; 50, w., 12th; 82, s., 15th; 88, s., 16th; 62, nw., 17th; 54, nw., 19th; 78, nw., 20th; 62, nw., 21st; 70, w., 22d; 54, w., 23d; 70, w., 25th; 80, nw., 26th; 58, nw., 27th; 50, nw., 28th; 60, nw., 29th; 58, nw., 30th.

Pike's Peak, Colorado, 60, w., 1st; 60, sw., 3d; 74, w., 5th; 68, w., 8th; 66, w., 9th; 56, w., 10th; 72, sw., 13th; 52, w., 31st.

Valentine, Nebraska, 54, e., 9th.

Kitty Hawk, North Carolina, 56, n., 1st.

Cape Henry, Virginia, 60, nw., 1st; 54, n., 2d.

Chincoteague, Virginia, 50, ne., 1st.

LOCAL STORMS AND TORNADOES.

La Plata, Macon county, Missouri: a heavy wind storm prevailed here on the night of the 4–5th. Orchards, fences, and small houses were leveled to the ground, and cattle killed. Owing to the violence of the storm many persons sought refuge in cellars.

Woodstock, McHenry county, Illinois: the portion of country lying between the towns of Ringwood and McHenry, in this county, was visited on the 6th by a tornado, which was very disastrous to farmers in the small area over which it passed. At noon the atmosphere was clear and warm, temperature rising until about 2 p. m., when the sky to the north became overcast with heavy black clouds; the sultry air suddenly began to get very cool, the mercury falling several degrees in a few minutes. The northern clouds grew blacker and moved southward, and the lull which had followed the first cool breeze was suddenly broken by the roar of the tornado. Trees bent before the blast like grain, and the smaller ones were snapped in pieces or twisted from the earth by the roots. The air was filled with flying limbs, pieces of boards, and other objects. Two men were killed, and several persons injured.

Oskaloosa, Mahaska county, Iowa: on the 9th, a violent wind storm did considerable damage to property; houses were unroofed, trees and fences blown down, and the amphitheatre in the fair grounds was wrecked.

Pittsburg, Pennsylvania: reports from points along the Conemaugh Valley, in Indiana county, indicate the occurrence of a tornado in that section on the evening of the 10th. Several persons were seriously injured. Descriptions of this tornado say that telegraph poles along the railroad were blown down, cows were killed and trees were blown fully two hundred feet in the air, while many fences and small buildings were destroyed.

McConnellsburg, Indiana county, Pennsylvania: the Methodist Episcopal church was struck by lightning during the evening of the 10th and considerably damaged. Two men engaged in burning lime were prostrated by a bolt of lightning and two horses killed.

Blairsville, Indiana county, Pennsylvania: a heavy hail storm passed over this place about 6 p. m. of the 10th, and was followed by a tornado which swept from Salina along the valley of the Conemaugh River to Coketown, cutting down trees and destroying numerous outhouses and barns. It caused the water in the river to rise to the height of seventy-five feet, in the form of an inverted water-spout, which revolved about a moving centre, travelling across and up the stream until it reached the new Coketown bridge, an iron structure five hundred and twenty feet long, which was damaged to the extent of $5,000. The tornado left the river at this point and continued across the country, blowing down telegraph poles, trees, smoke-stacks, and barns. Near Conemaugh a number of freight cars were standing on a siding; the tornado lifted them bodily from the track and dashed them to the ground.

Kansas City, Missouri: a very disastrous tornado occurred at

this place on the afternoon of the 11th. The approach of the storm was preceded by the appearance of a very dark cloud in the southwestern sky, which moved rapidly toward the city, and suddenly spread over the entire sky, enveloping the city with the darkness of night. During this darkness the people were much alarmed and business was suspended The Lathrop school building was almost destroyed, the entire upper portion of the structure being blown in. The heavy masonry and timbers fell through the third and second floors, killing fifteen children and wounding many more. A factory in which a number of persons were at work was destroyed, killing and injuring several persons. The court-house, as well as many other buildings, was wrecked. The tornado was accompanied by very heavy rain, being described by witnessses as "cloud bursts," which fell in torrents for three-quarters of an hour.

Odell, Livingston county, Illinois: a tornado occurred here on the night of the 11th. In a few seconds after the storm first reached the town several large stores and a hotel were unroofed; one large brick building was nearly destroyed, filling the air with debris. All the telegraph wires in the vicinity were down.

Rockford, Winnebago county, Illinois: at 5.30 p. m. of the 11th heavy roaring clouds from the south and east met over Rockford, producing a destructive thunder-storm.

Attica, Fountain county, Indiana: a tornado occurred at Attica on the 12th at 6.10 p. m. In five minutes two hundred houses were destroyed, among which were the Revere House and the Chicago and Great Southern freight depot. Many business houses and residences were in ruins, and twelve persons were injured. The afternoon was oppressively warm. At the hour named above black clouds west of the town approached each other from north and south and formed a junction apparently about half a mile west of and opposite the centre of the town, when it rapidly approached. The path of the storm, which was traced by the wreck of buildings, was from one to two hundred yards wide, and extended towards the northeast.

Albany, Tuscarawas county, Ohio: a tornado passed through Columbia township, Meigs county, five miles from this place, on the 12th, between 10 p. m. and midnight. Its track was from one-fourth to one-half mile wide. Considerable property was destroyed and several persons killed or injured.

Athens, Athens county, Ohio: near Carpenter's Station, in the southern part of this county, two persons were instantly killed and several injured by a tornado on the 12th. The storm was attended with serious and widespread damage to farm property and bridges throughout the county. The rainfall was very heavy, and all streams were swollen.

Richmond, Wayne county, Indiana: a tornado passed over the southeastern portion of this county on the 12th doing great damage. Many farm houses and barns were blown down. The track of the cyclone was about half a mile wide, and the woods in its track were entirely leveled. No lives were lost, but several persons were injured. At Richmond the rain was reported to have been the heaviest ever known, although not accompanied by winds. About eighty feet of the Pan-Handle track, east of the town, was swept away by the bursting of the dam at Glen Miller.

Miamisburg, Montgomery county, Ohio, was visited by a severe gale and rain storm, which was attended by heavy thunder and incessant lightning, on the night of the 12–13th. The path of greatest severity is reported to have been about thirteen miles wide. In some places the storm was attended by the characteristics of a tornado. Forests were prostrated in great masses; farm houses, sheds, barns, schools, and churches wrecked, and hundreds of bridges swept from the pikes, country roads, and railways.

Frankfort, Kentucky: on the 13th a severe thunder-storm, attended by high wind and heavy hail, occurred. Considerable damage was inflicted upon trees, gardens, and houses.

Jacksonville, Morgan county, Illinois: a tornado devastated a section of country north of this place on the night of the 13–14th. Many farm-houses were wrecked and orchards blown down. The loss was estimated at $15,000.

Portland, Indiana: a tornado passed two miles north of this place on the 14th, at 8 p. m. Houses, fences, and trees were thrown down. Several persons were killed and wounded.

Topeka, Shawnee county, Kansas: a destructive tornado passed across the northern part of this county on the 14th, and damaged a portion of the town of Meriden. About 10 o'clock in the morning a very black cloud came up suddenly from the southeast, and sweeping through the eastern portion of the town, destroyed a number of buildings and injured several persons.

Lansing, Michigan: a tornado formed at a point about one mile north of Lansing on the night of the 14–15th, and moved in a northerly direction, leveling fences, forests, and buildings. When the black, funnel-shaped cloud was first noticed it seemed to be motionless for a few seconds and then moved slowly toward the north, with the tube of the funnel touching the ground. It cut a swath one-quarter of a mile wide through forests and orchards; but little property was destroyed as the tornado passed through a section of country which was but thinly settled.

Cincinnati, Ohio: a tornado passed over Mercer county on the night of the 14–15th. Shortly after 9 p. m. of the 14th huge black clouds appeared in the northwest, the atmosphere appeared to be heavily charged with electricity, heavy peals of thunder and vivid flashes of lightning, accompanied by an unusually warm and stagnant atmosphere, caused considerable alarm and uneasiness. The tornado developed about 10 p. m., and swept through the entire western section of this county. It was confined to a belt not more than a quarter of a mile wide, but within this area everything was leveled to the earth—houses and buildings of all descriptions were wrecked and scattered over miles of territory. Forests were laid low, crops destroyed, fences torn down, and hundreds of families were made homeless. It is reported that more than thirty persons lost their lives and many times that number were wounded. From Mercer the tornado passed into Auglaize county and continued its work of destruction, but the damage was less severe in this county than at other points. Hardin county was next visited by the storm. Previously its path had been through the open country over farms and forests and had met with no towns in its path. Shortly before midnight it arrived at Dunkirk, a town of 1,300 inhabitants, in the northeastern corner of the county. The people were asleep when the tornado came upon them. Its work of destruction was done in less than one minute. Five persons were found dead, and twenty, badly injured, were taken from the wrecks of their dwellings. In Carey, Wyandotte county, seventeen buildings were completely destroyed and six persons killed. Bloomville, South Carey, Wharton, and many other villages suffered from destruction of lives and property. The tornado next passed into Seneca county and, coming as it did, at midnight, after the inhabitants had retired, was more than usually destructive to life. This tornado appears to have originated in Anderson, Indiana, and crossing into Ohio passed in a northeasterly direction through seven counties in that state, terminating in the central portion of Seneca county, forming a path about one hundred and ten miles long, and varying from a quarter to a mile in width. This path was broken at numerous points by portions of country untouched by the storm, which appeared to touch the surface of the country at points and then rise into the air descending again further on. It was accompanied by heavy rain, and much damage resulted from freshets washing away soil and crops.

Milledgeville, Georgia: a very severe thunder-storm occurred here on the 18th, at 6.30 p. m. Two miles south of this place it assumed the proportions of a tornado which came from the southwest. Considerable timber was destroyed and several farm houses were blown down.

Thornville, Lapeer county, Michigan: on the night of the

26–27th, a tornado crossed Lapeer county, moving in a southwest direction from Marathon to Almont and touching the earth every mile or two. The track was nowhere more than eighty rods wide, in some places only ten rods. The limits of its track were very sharply defined. In some cases the débris was carried four miles.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the following table are shown the danger-points at the various river stations; the highest and lowest depths for May, 1886, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, May, 1886.

[*Expressed in feet and tenths.*]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, Louisiana	29.9	1	18.0	31	5.2	12.8
Arkansas River:						
Fort Smith, Arkansas	22.0	1	9.8	30, 31	3.3	6.5
Little Rock, Arkansas	23.0	2	11.5	30, 31	3.6	7.9
Missouri River:						
Yankton, Dakota	24.0	15, 16	16.9	7	14.7	2.2
Omaha, Nebraska	18.0	6	9.8	26 to 31	8.2	1.6
Leavenworth, Kansas	20.0	7	11.9	31	9.2	2.7
Mississippi River:						
Saint Paul, Minnesota	14.5	3, 4, 5	8.0	30, 31	4.3	3.7
La Crosse, Wisconsin	24.0	1	10.2	31	6.5	3.7
Dubuque, Iowa	16.0	.....	.....	.....	.....	.....
Davenport, Iowa	15.0	2	12.7	31	6.5	6.2
Keokuk, Iowa	14.0	6	16.0	31	8.1	7.9
Saint Louis, Missouri	32.0	13	37.0	31	18.0	9.0
Cairo, Illinois	40.0	17, 18	39.8	6	24.7	15.1
Memphis, Tennessee	34.0	1	34.6	9	22.8	11.8
Vicksburg, Mississippi	41.0	7, 8, 9	44.2	31	41.9	2.3
New Orleans, Louisiana	13.0	14, 15, 19, 20, 23, 24, 25, 27 to 31	14.3	1	13.9	0.4
Ohio River:						
Pittsburg, Pennsylvania	22.0	15	13.0	31	2.4	10.6
Cincinnati, Ohio	50.0	15	37.0	31	12.8	24.2
Louisville, Kentucky	25.0	16	14.7	2	6.5	8.2
Cumberland River:						
Nashville, Tennessee	40.0	13	28.7	30	5.0	23.7
Tennessee River:						
Chattanooga, Tennessee	33.0	12	10.8	19	5.7	5.1
Monongahela River:						
Pittsburg, Pennsylvania	20.0	15	13.0	31	2.4	10.6
Savannah River:						
Augusta, Georgia	32.0	21	32.5	16	7.7	24.8
Mobile River:						
Mobile, Alabama	.....	19	18.7	26	16.8	1.9
Sacramento River:						
Red Bluff, California	.....	8	7.0	31	3.2	3.8
Sacramento, California	.....	1	23.0	30, 31	21.0	2.0
Willamette River:						
Portland, Oregon	.....	31	17.4	7	7.3	10.1
Colorado River:						
Yuma, Arizona	.....	31	24.5	4, 5, 6	18.5	6.0

The Mississippi River was at the danger point, or above it, at New Orleans, Louisiana, during the last half of the month; from New Orleans northward the highest stage of water occurred at Vicksburg, Mississippi, on the 7th, 8th, and 9th, and at Memphis, Tennessee, on the 1st.

Owing to the drought which prevailed in the Red River valley the Red River was very low during the entire month, reaching its lowest point on the 31st.

The Ohio River was highest at all points about the middle of the month and lowest on the 31st.

The Missouri River reached its lowest point on the 31st.

ICE IN RIVERS AND HARBORS.

Port Huron, Michigan: small quantities of ice were seen floating down the Saint Clair River on the 1st and 2d.

Duluth, Minnesota: during the night of the 3–4th the wind blew briskly from the northwest, driving the ice from the north shore; heavy rain followed, causing a break in the ice, which was taken advantage of by many boats outside. The steamer "Campana" arrived at noon, being the first arrival of the season.

Fort Benton, Montana: the steamer "Rosebud" arrived from Bismarck on the 15th, being the first vessel of the season to arrive here.

Saint Vincent, Minnesota: the steamer "Pluck" from Fargo, Dakota, arrived on the 28th, being the first boat reaching here since the opening of navigation.

FLOODS.

San Antonio, Texas: a heavy thunder storm occurred at this place during the afternoon of the 2d, 2.30 inches of rain falling in less than two hours. The storm was quite severe in the town, overflowing the irrigating ditches and the San Antonio River, which rose five feet in less than three hours, carrying away fences and destroying vegetable gardens, entailing a loss of $20,000. Excepting the damage caused by the flood this rain was of great benefit to farmers and stockmen, as very little rain had fallen during the two preceding months.

Lead Hill, Arkansas: reports from Ozark county, Missouri, say: on the night of the 5–6th the Little North Fork Creek, in this county, overflowed its banks, and destroyed considerable farm property. Beaver Creek, in Douglas and Taney counties, Missouri, also overflowed at the same time, and did much damage to farm land.

Springfield, Missouri: a very heavy rainfall prevailed at this place and over the adjacent country during the 5th and 6th, 6.60 inches of rain falling in twenty-seven hours, doing a large amount of damage to property both in town and over the surrounding country. The rain was preceded by hail, which fell to a considerable depth in about fifteen minutes, many of the hailstones being from one-half to two inches in diameter. All the creeks and their branches became much swollen, tearing away fences and inundating bottom lands. Jordan Creek, which runs directly through this city, rose higher than for many years, overflowing the lowland and driving thirty or forty families from their homes. Some of the women and children were carried out on horseback and on men's shoulders to the higher ground to escape drowning, the water in places rising into the second stories of the dwellings. Three of the city's wooden bridges were washed away, and the basements of a number of business houses were filled with water. Some of the smaller dwelling houses were carried from their foundations. A large amount of lumber was lost. Half a mile of the Gulf Railway track, within the city limits, was completely submerged, interrupting the passage of trains. The damage in the city and surrounding country was estimated at $115,000.

Emporia, Kansas: a heavy fall of rain, which is described by those who saw it as a "waterspout," passed down Jacobs' creek, fourteen miles southwest of this place, on the 6th. Five persons who were traveling in a wagon were overtaken by the flood and the vehicle was swept away, two of its occupants being drowned. The storm between Emporia and Florence was very severe, hailstones of large size falling. An eastern bound passenger train on the Santa Fé railroad had many windows broken by the hail.

Fort Scott, Bourbon county, Kansas: a destructive rainstorm occurred at this place about noon on the 6th. During the storm an ice dam broke and the water, heretofore held back by the dam, uniting with the already swollen stream, rushed down the valley, destroying a house and drowning one of its occupants.

Nevada, Vernon county, Missouri: it is estimated that the damage done to buildings and culverts by the heavy rainstorm of the 6th will reach $10,000. The Missouri Pacific Railroad track was washed out in several places between this place and Fort Scott, delaying trains for twenty-four hours. Crops were seriously damaged.

Dale Enterprise, Rockingham county, Virginia: the heavy rainfall of the month did great damage to county roads and railway tracks. Plowed fields were badly washed. The forks of the Shenandoah River were, on the 8th, as high as during the flood of November 24th, 1877.

Pittsburg, Pennsylvania: owing to heavy rainfall at the headwaters the Monongahela River rose nine feet in twenty-four hours on the 8th and 9th. A fleet of coal barges broke from its wharf and was carried down the river, detaching several other fleets with which it came in contact. Thirty-three barges were sunk or damaged, entailing a loss of about $100,000.

Jacksonborough, Butler county, Ohio: on the 12th heavy rain did considerable damage to roads and bridges. Cornfields were overflowed, necessitating replanting.

Xenia, Ohio: about 8 p. m. of the 12th this place was the scene of an unusually disastrous thunder-storm and flood. The rain fell in sheets while the lightning was incessant. Shawnee Creek, heretofore a small stream, suddenly overflowed its banks and in the darkness drowned twenty-nine persons and injured about one hundred, besides destroying much property. The destruction to property in this town amounted to $75,000, while the railroads suffered much more. The bridges between here and Spring Valley, on the Little Miami Railroad, and about five miles of track were carried away. The Dayton and Ironton Railroad, between here and Trebeins, was washed out badly. One of the causes of the destruction in Xenia was a small culvert under the Columbus and Zenia Railroad, just east of the Wilmington pike. Being insufficient to let the water through, the flood rose to the top of the road, forming a lake, which suddenly broke the embankment, and letting the water out with a rush, it came down into the town in a body ten to fifteen feet high, carrying everything before it.

Piqua, Miama county, Ohio: heavy rain fell continuously during the 12th, causing the Big Miami River to rise rapidly and flood the lower part of the town.

Marion, Grant county, Indiana: the growing crops, especially corn and wheat, sustained great damage by the overflow of the Mississenewa River, caused by the unusually heavy rains of the 11th, 12th, and 13th. Hundreds of fields were submerged.

Columbus, Ohio: at 10.10 p. m. of the 12th a very heavy rain set in, accompanied by vivid and incessant lightning, which continued until a late hour at night. The rainfall was very heavy, 1.93 inches falling in a few hours. Sewers were insufficient to carry off the volume of water, and many cellars in the lower part of the city were flooded and their contents damaged.

Dayton, Montgomery county, Ohio: on the night of the 12–13th a very damaging wind and rain storm occurred in this city and the adjacent county. This storm was followed by a destructive flood. In the city the damage from flood was great; whole sections of the town were submerged, and the people compelled to leave their homes for safety. Eight houses along Wolf Creek, in the western part of the city, were carried away, together with their contents. A bridge across the same creek was carried down the stream, as was also the Pan Handle bridge, about a mile from Dayton. The Miami River presented to view a rapidly flowing volume of water, bearing on its surface houses, barns, sheds, cattle, and driftwood of fences and trees. The canal bank south of the city was broken and the adjoining fields were flooded. The damage to crops and fruit in this county was quite extensive, and much of the land about Dayton was completely inundated. The greatest loss fell on farmers, as numerous farms that were situated on hillsides had the soil washed away as deep as it was plowed. In this county alone ten thousand acres of corn fields had the newly planted corn washed out; the same damage was suffered by tobacco and potato fields. The total loss is estimated at nearly $1,000,000.

Eaton, Preble county, Ohio: a destructive hail and rain storm occurred here on the afternoon of the 12th and night of the 12–13th. The damage to bridges over Seven Mile Run and other streams was considerable. A bridge immediately west of the town, that had stood for sixty years, was swept away, and in the eastern part of the county several houses and barns were destroyed. Much damage was done to other farm property, including crops.

New Straitsville, Perry county, Ohio: during the night of the 12–13th a severe rain and wind storm occurred at this place. A number of houses were flooded and trees uprooted by the wind. Miners near Shawnee were obliged to cease operations on account of high water. The New York Furnace dams gave way, flooding the furnace and otherwise injuring property to such an extent as to require two weeks in which to repair damages.

Springfield, Ohio: the storm of the night of the 12–13th was very destructive in Springfield and the adjacent country. East High street bridge, recently constructed at a cost of $6,000, was undermined and thrown down. Hundreds of families in the eastern and southern parts of the town were driven from their houses by the flood. Much property was destroyed in that quarter of the city. A bridge over the east fork of the Little Miami River, near Harmony, was carried down the stream, destroying an iron bridge with which it came in contact two miles below.

Connersville, Fayette county, Indiana: the White Water River was reported higher on the morning of the 13th than it had been for twenty years. The levees along the river were all broken and the feeder dam at Lockport carried away, cutting off the town's water supply. The White Water Railroad bridge at Hagerstown was partially destroyed and the railroad undermined at several other places, stopping all travel. Wheat, corn, and other crops were washed out or buried in the sediment left by the retiring water. Thirty head of cattle were carried down the river and drowned.

Saint Louis, Missouri: an unusually heavy rain and wind storm visited this city at 6 p. m. of the 14th. The storm came from the southwest and lasted only one hour. Over two thousand buildings, located on streets in which the sewers had become choked, were flooded with from two to four feet of water. The streets, for blocks in all directions, were submerged, and all street-car traffic was suspended. At south Saint Louis the damage was heavy, Kosciusko, Broadway, Jackson, and Dakota streets being flooded for miles, and the residents forced to leave their homes for safety. The southwestern and western parts of the city also suffered from water; at Lafayette and Ohio avenue the flood was ten feet deep. This freshet arose very suddenly, the flooded portions of the city having been perfectly dry two hours before the time of maximum height of the flood.

Charlotte, North Carolina: unusually heavy rain fell over a district embracing the Carolinas on the 18th, 19th, and 20th, the total precipitation for those days, at this place, being 8.25 inches; streams were very much swollen and great damage from floods was reported. Three washouts occurred on the Charlotte, Columbia, and Augusta Railroad, and other railroads suffered severe injury. A trestle over Coddle Creek was washed away and one span of the bridge, one hundred and fifty feet long, over the Yadkin River was destroyed. The greatest loss was sustained by farmers, their crops being injured and stock drowned.

Spartanburg, Spartanburg county, South Carolina: the heavy rainfall of the 18th, 19th, and 20th, 9.40 inches, caused destructive floods on bottom lands, and did much damage to crops.

Johnsonville, Humphreys county, Tennessee: during the afternoon of the 19th a very heavy rain storm, accompanied by high wind, occurred, inflicting considerable damage on farmers.

Columbia, South Carolina: during the 20th a heavy rain storm visited this city and the upper part of the state, causing freshets which destroyed considerable property. Many of the railroads entering the city were rendered impassable for several days, and the water works were swept away. The Columbia Canal, which the state had been building for five years, was in some places completely destroyed. Considerable cotton land was overflowed, and the loss of cattle was very great; one cattle raiser alone is reported to have lost $10,000 worth of live stock. The factories in the city depending upon water power were obliged to suspend operations on account of the high water in the Congaree River.

Augusta, Georgia: in consequence of the heavy rains of the 18th and 19th, the Savannah River was very high on the 20th and 21st, reaching, at 9 p. m. of the 20th, a depth of thirty-two feet above low-water mark, exceeding the flood of April 1, 1886, by two feet, and being higher than any flood since the freshet

of 1865. All factories and mills in the western part of the city were compelled to suspend work. Farm property suffered great damage; hay, cattle, and fences were carried away and growing crops washed out or buried in the sediment left by the water. It is estimated that the loss to planters occupying the bottom lands between here and New Savannah will exceed $50,000.

Charleston, South Carolina: on the 20th and 21st destructive freshets occurred in all the streams in the northern and northeastern parts of the state. The Pedee River was very high, overflowing and completely destroying crops in the lowlands. Considerable damage was also done to railroads and crops in the northern and western parts of the state.

Abingdon, Washington county, Virginia: a very heavy fall of rain, which is described as a "water-spout," occurred here on the 27th. Farm property was injured and one person drowned.

HIGH TIDES.

Cape Henry, Virginia, 1st.
Smithville, North Carolina, 29th, 30th.
Cedar Keys, Florida, 6th.

LOW TIDES.

Albany, New York, 27th: as a result of ebb tide in the river the water was quite low and a number of vessels were grounded.

Low tides were also reported from—
Indianola, Texas, 1st, 2d, 3d, 6th, 16th, 20th, 27th, 28th.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for May, 1886, with the telegraphic reports for the succeeding thirty-two hours, shows the general average percentage of verifications to be 75.85 per cent. The percentages for the four elements are: Weather, 78.21; wind, 76.56; temperature, 72.27; barometer, 75.53 per cent. The percentages for the several states are: Maine, 72.51; New Hampshire, 74.57; Vermont, 73.97; Massachusetts, 74.74; Rhode Island, 70.43; Connecticut, 69.66; New York, 74.65; Pennsylvania, 72.95; New Jersey, 77.81; Delaware, 77.26; Maryland, 76.84; Virginia, 78.08; North Carolina, 79.64; South Carolina, 85.09; Georgia, 85.23; Florida, 80.98; Alabama, 84.73; Mississippi, 84.50; Louisiana, 86.78; Texas, 84.42; Tennessee, 74.19; Kentucky, 77.69; Ohio, 74.00; West Virginia, 69.02; Indiana, 77.32; Illinois, 74.82; Michigan, 73.30; Wisconsin, 70.14; Minnesota, 67.03; Iowa, 69.62; Nebraska, 65.16; Kansas, 68.62; Missouri, 74.01; Arkansas, 79.48; Colorado, 84.44; East Dakota, 65.15. There were twenty-one omissions to predict, out of 9,764, or 0.22 per cent. Of the 9,743 predictions that have been made, seven hundred and fifty-six, or 7.76 per cent., are considered to have entirely failed; five hundred and forty-eight, or 5.62 per cent., were one-fourth verified; 1,730, or 17.76 per cent., were one-half verified; 1,283, or 13.17 per cent., were three-fourths verified; 5,426, or 55.69 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During May, 1886, there were fifty-two signals of various kinds displayed, of which number, twenty-four, or 46.15 per cent., were fully justified both as to the direction and velocities of the winds. Of the signals above mentioned twelve were ordered for northwesterly winds; of these, eight, or 66.67 per cent. were justified both as to direction and velocity, and nine, or 75.0 per cent., were justified as to velocity only. Seven signals were ordered for southwesterly winds, and two, or 28.57 per cent., were justified. Nine signals were ordered for northeasterly winds, and eight, or 88.88 per cent., were justified. Of fifteen cautionary signals ordered, without specifying the direction, none were justified. Nine "on-shore" signals were ordered at lake stations, and six, or 66.67 per cent., were justified.

In fifty-four cases winds occurred which would have justified the display of signals.

COLD-WAVE SIGNALS.

No cold-wave signals were ordered during May.

RAILWAY WEATHER SIGNALS.

Prof. P. H. Mell, jr., director of the "Alabama Weather Service," in the report for May, 1886, states:

The verifications of predictions for the whole area was 94 per cent. for temperature, and 90 per cent. for weather.

The following corporations comprise this system: South and North; Montgomery and Mobile; Mobile and Girard; Georgia Pacific; East Tennessee, Virginia and Georgia system in Alabama; Memphis and Charleston; Columbus Western; Atlanta and West Point of Georgia; Northeastern of Georgia; Western and Atlantic; East Tennessee, Virginia and Georgia system in Georgia; Montgomery and Eufaula; Pensacola and Selma; Pensacola and Atlantic; and the cities of Milledgeville, Georgia, and Talladega, Alabama.

Prof. Winslow Upton, director of the "New England Meteorological Society," in the report for May, 1886, states:

The verification of weather signals at New Haven was 71 per cent. for temperature, 83.9 for weather; at eighteen other stations reporting to the Secretary, 88.5 for temperature, 79.5 for weather. Local predictions made at Blue Hill gave 63 per cent. for rains, 81 for weather.

J. D. Plunkett, M. D., president of the "Tennessee State Board of Health," in the report for May, 1886, makes the percentage of verifications for temperature in the state 89.5, and weather, 84.4.

ATMOSPHERIC ELECTRICITY.

AURORAS.

The brilliant auroral display of the 8–9th was extensively observed, it having been reported from stations on the north Pacific coast, in the northern plateau, northern slope, and from various stations in that part of the country from 100° W. eastward to the Atlantic ocean, and lying north of the thirty-eighth parallel. This aurora was observed as far south as Statesville, North Carolina, and by a vessel on the Atlantic in N. 40° 24′, W. 60° 40′.

Displays were reported during the month as follows:

Mackinaw City, Michigan: an auroral arch of 15° altitude and 80° azimuth, with an occasional streamer, was observed during the night of the 1st and 2d. A faint auroral light of 15° altitude and 45° azimuth, was also seen on the 20th, beginning at 10.30 p. m. and continuing until after midnight.

Tatoosh Island, Washington Territory: on the 3d an aurora was observed at 8 p. m., consisting of a diffuse white light extending from 3° east of, to 24° west of north.

Yankton, Dakota: an aurora was visible from 10.00 to 11.50 p. m. of the 8th, consisting of an arch of white light with streamers reaching, at times, within 30° of the zenith.

Valentine, Nebraska: an auroral arch was visible from 9.30 p. m. of the 8th until after midnight of the 9th. The centre of the aurora was about 15° east of north and extended over 30° of azimuth. At 10.20 p. m. streamers extending almost to the zenith were observed; at times they extended several degrees below the arch. The maximum brilliancy occurred at 10.30 p. m.

Saint Vincent, Minnesota: on the 8th at 9.50 p. m., a remarkably brilliant auroral display began. When first observed it consisted of a single streamer having a width varying from 4° to 8°, which spanned the sky from east to west, at the same time having a preceptible movement toward the west. At 10 p. m. the aurora had changed in shape, and appeared as a perfect corona; later it appeared as a diffuse, whitish light in the west, while in the east it presented a deep orange tint and had a very active undulatory motion, constantly changing in form. At 10.20 p. m. a beautiful and well defined "auroral curtain" was formed in the east, which appeared as though hung in loops or folds, owing to the peculiar arrangement of the beams; this formation lasted about five minutes. At 11.40 p. m. it appeared in the form of numerous broad streams of white light moving rapidly toward the zenith. At 12.40 a. m. of the 9th, a dark bank was observed on the northern horizon and the light above it was more brilliant, while in the east the aurora had almost disappeared. The phenomenon continued until 2.10 a. m. The Signal Service observer at this station

Table of miscellaneous meteorological data for May, 1886—Signal Service observations.

Stations.	Elevation above sea-level.	Atmospheric pressure (in inches and hundredths).								Temperature of the air (in degrees Fahrenheit).										Mean rel. humidity.	Mean dew-point.	Precipitation.		Winds.				No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.				Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.				Daily ranges.								Departure from normal.	Total movement.	Prevailing direction.	Maximum velocity.						
					Highest barometer	Date.	Lowest barometer	Date.				Max.	Date.	Mean max	Min.	Date.	Mean min.	Monthly range.	Greatest.	Date.	Least.	Date.						Miles p. h.	Direction.	Date.				
New England.																															
Eastport	61	29.82	—.09	29.89	30.30	18	29.31	25	0.99	47.0	— 0.3	67.4	6	54.0	35.2	2	40.3	32.0	25.5	6	4.9	25	81.7	40.9	3.49	— 1.05	4,523	s.	29	e.	8	14	4	21	6
Portland	99	29.77	—.10	29.87	30.32	18	29.41	25	0.91	53.1	— 1.7	76.9	23	61.1	36.1	2	45.4	40.8	28.6	22	3.5	15	76.0	45.0	4.07	+ 0.91	5,557	s.	26	nw.	9	13	10	14	7
Mount Washington	6,279	23.68	.....	29.86	30.20	18	29.31	26	0.89	34.5	+ 0.9	49.2	30	40.7	18.5	26	29.0	30.7	21.9	25	3.9	26	89.7	31.5	3.25	— 3.27	21,985	nw.	88	s.	16	13	1	17	13
Boston	125	29.77	—.09	29.90	30.35	18	29.46	25	0.89	56.2	+ 0.2	85.2	30	65.3	38.1	3	48.3	47.1	38.8	4	6.1	12	68.0	44.6	3.08	— 0.44	8,640	w.	36	e.	11	13	7	19	5
Block Island	27	29.88	.....	29.90	30.35	18	29.49	25	0.87	53.5	+ 1.8	73.2	23	59.7	42.0	2	48.6	31.2	19.9	9	4.1	11	85.7	49.0	4.14	— 0.75	10,533	sw.	38	ne.	14	12	6	19	6
Narragansett Pier	.....	.....	.....	.....	.....	.....	.....	.....	.....	55.8	.....	84.0	23	64.1	38.0	1	47.5	46.0	.....	.....	.....	.....	.....	.....	3.55	+ 0.14	.....	.....	.....	.....	...	12	...	...	...
New Haven	107	29.80	.....	29.91	30.34	18	29.55	25	0.79	56.6	— 1.3	83.5	23	66.2	32.3	1	47.2	51.2	28.8	1	7.9	11	69.6	45.6	2.74	— 0.86	5,763	s.	30	ne.	8	15	12	10	9
New London	47	29.88	—.09	29.92	30.37	18	29.54	25	0.83	56.8	+ 0.6	83.3	23	65.1	37.6	2	48.5	45.7	30.9	6	6.2	12	71.3	46.7	3.45	— 0.11	5,359	sw.	31	e.	11	11	13	12	6
Mid. Atlantic States.																															
Albany	83	29.83	—.08	29.91	30.34	18	29.58	27	0.76	59.1	0.0	83.0	30	69.6	39.6	1	49.0	43.4	31.2	1	5.5	15	63.8	45.6	3.40	+ 0.53	4,326	s.	28	s.	15	13	9	17	5
New York City	168	29.75	—.09	29.91	30.32	18	29.58	25	0.74	58.5	— 0.4	86.0	23	67.0	42.0	1	51.3	44.0	24.2	23	5.7	13	70.8	48.0	6.53	+ 3.71	6,384	nw.	34	ne.	8	13	9	14	8
Philadelphia	117	29.81	—.07	29.92	30.33	18	29.58	8	0.75	60.9	— 1.0	86.2	23	70.2	43.4	1	52.8	42.8	28.1	3	4.8	8	73.4	51.2	4.50	+ 1.61	7,264	s.	35	n.	8	17	11	12	8
Atlantic City	13	29.90	—.09	29.90	30.34	18	29.49	8	0.85	56.0	— 1.1	74.9	9	62.2	40.5	3	49.5	34.4	25.5	9	4.5	13	82.2	50.1	4.15	+ 1.76	7,136	sw.	39	ne.	2	20	11	11	9
Sandy Hook	28	29.88	—.10	29.90	30.34	18	29.56	8	0.78	57.9	— 0.5	86.1	30	66.7	45.5	1	52.1	40.6	24.4	30	3.7	13	79.0	50.6	8.46	+ 4.49	11,601	sw.	48	nw.	5	20	10	10	11
Cape Henlopen	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	...	...	...	...
Baltimore	45	29.89	—.08	29.92	30.30	18	29.56	8	0.74	61.9	— 2.6	87.5	30	70.9	45.2	17	54.1	42.3	30.0	30	4.8	7	70.2	50.6	7.07	+ 4.07	4,235	se.	20	sw.	27	17	13	10	8
Ocean City	.....	.....	.....	.....	.....	.....	.....	.....	.....	56.8	.....	72.1	29	63.0	40.6	7	50.5	31.5	.....	.....	.....	.....	.....	.....	4.47	+ 1.97	.....	.....	.....	.....	...	10	...	...	...
Washington City	106	29.83	—.08	29.93	30.31	18	29.55	8	0.76	62.1	— 2.1	83.8	5	70.8	43.4	3	53.9	40.4	34.3	3	6.6	14	80.5	55.3	10.60	+ 7.62	4,110	s.	24	w.	23	18	14	10	9
Cape Henry	16	29.92	—.08	29.92	30.35	18	29.48	8	0.86	63.1	— 0.9	86.0	10	71.4	46.1	2	55.7	39.9	32.6	4	5.5	1	80.6	56.4	7.25	+ 3.91	10,796	sw.	60	nw.	1	12	6	13	12
Chincoteague	8	29.92	—.08	29.91	30.35	18	29.46	8	0.89	59.6	— 0.5	77.7	24	65.8	44.0	2	53.2	33.7	20.7	11	3.1	19	82.4	53.8	6.18	+ 3.34	9,685	s.	50	ne.	1	15	8	12	11
Lynchburg	652	29.26	—.07	29.92	30.30	18	29.55	7	0.74	65.6	— 0.7	91.1	13	76.4	45.2	17	55.1	45.9	35.6	4	6.2	7	76.5	56.7	6.74	+ 3.68	2,915	s.	17	nw.	8	10	6	18	7
Norfolk	30	29.92	—.07	29.93	30.32	18	29.48	8	0.85	65.0	— 1.6	87.0	15	73.2	44.7	2	54.1	42.3	34.3	15	2.6	1	74.7	55.9	8.32	+ 4.76	4,732	sw.	27	ne.	1	16	8	14	9
South Atlantic States.																															
Charlotte	808	29.14	—.03	29.95	30.25	17	29.58	7	0.68	68.3	— 0.4	92.0	13	78.9	45.0	1	57.4	47.0	30.4	3	6.1	18	77.8	60.5	11.04	+ 7.72	4,007	sw.	25	w.	10	9	7	18	6
Fort Macon	11	29.97	—.02	29.95	30.29	18	29.50	1	0.78	68.1	+ 0.2	78.8	28	73.0	47.4	2	62.8	31.4	20.8	3	5.2	31	81.4	62.0	2.33	— 2.03	11,758	sw.	44	nw.	1	10	4	13	14
Hatteras	12	29.96	—.04	29.97	30.33	18	29.42	1	0.91	66.2	+ 0.1	80.0	22	72.1	48.7	2	60.3	31.3	20.0	15	5.5	2	80.1	59.3	2.71	— 1.47	8,166	sw.	48	nw.	1	10	4	11	16
Kitty Hawk	9	29.96	—.07	29.95	30.37	18	29.48	1	0.89	63.9	0.0	84.9	24	72.4	45.0	2	57.2	39.9	27.6	4	5.3	17	76.9	55.8	7.27	+ 4.00	11,494	sw.	56	n.	1	10	6	15	10
New River Inlet	.....	.....	.....	.....	.....	.....	.....	.....	.....	68.6	.....	82.0	21	76.6	46.8	2	60.7	35.2	.....	.....	.....	.....	.....	.....	0.37	.....	.....	.....	.....	.....	...	3	...	...	...
Smithville	34	29.94	—.06	29.95	30.26	18	29.60	1	0.66	70.2	+ 0.7	84.0	15	76.9	45.1	2	62.7	38.9	25.1	3	5.1	17	78.9	62.9	1.46	— 1.59	8,879	sw.	36	sw.	7	11	3	10	18
Wash Woods	.....	.....	.....	.....	.....	.....	.....	.....	.....	66.1	.....	81.0	29	71.2	49.0	1	61.0	32.0	.....	.....	.....	.....	.....	.....	6.00	.....	.....	.....	.....	.....	...	9	...	...	...
Wilmington	52	29.93	—.04	29.96	30.28	18	29.61	1	0.67	70.2	+ 0.5	93.8	13	79.9	47.2	2	61.5	46.6	27.9	15	10.7	20	69.5	55.8	1.18	— 3.25	5,767	sw.	30	sw.	7	10	4	16	11
Charleston	52	29.95	—.03	29.97	30.24	4	29.69	7	0.54	72.8	+ 0.1	94.0	15	81.0	49.9	1	65.3	44.1	23.9	13	5.5	19	69.5	61.5	1.00	— 3.37	6,217	sw.	24	e.	17	5	5	11	15
Augusta	183	29.82	—.03	29.97	30.21	4	29.59	7	0.62	72.2	— 0.2	97.0	13	85.3	47.0	1	60.8	50.0	34.0	9	16.2	19	64.6	57.6	6.29	+ 2.97	2,785	sw.	26	w.	15	10	6	10	15
Savannah	87	29.92	—.02	29.98	30.23	4	29.70	7	0.53	75.0	+ 1.4	93.0	15	82.9	53.8	2	67.2	39.2	23.2	3	6.0	19	70.4	63.7	4.37	+ 1.42	5,920	s.	25	se.	13	6	4	9	18
Jacksonville	43	29.97	+.01	30.00	30.22	4	29.77	7	0.45	75.8	+ 0.3	91.8	14	85.0	55.9	3	66.9	35.9	20.2	9	7.0	20	69.4	63.9	2.81	— 1.38	4,619	sw.	27	sw.	7	5	5	11	15
Florida Peninsula.																															
Cedar Keys	22	29.99	—.01	29.97	30.15	4	29.80	8	0.34	74.0	— 1.8	86.8	17	79.6	59.2	1	68.8	27.6	19.4	17	6.1	23	77.0	66.1	0.71	— 2.01	6,453	w.	34	nw.	8	4	4	14	13
Key West	20	30.03	+.04	30.00	30.12	12	29.85	8	0.27	78.9	— 1.1	90.9	20	84.8	69.5	2	75.2	21.4	16.6	12	4.4	8	72.7	69.1	0.11	— 3.86	6,988	n.	26	e.	3	3	4	14	13
Sanford	25	30.02	.....	30.01	30.19	4	29.82	8	0.36	74.4	— 0.6	93.1	15	85.2	57.6	2	65.4	35.5	28.8	15	11.9	18	71.7	63.5	0.89	— 2.12	3,927	w.	18	nw.	31	4	3	14	14
Eastern Gulf States.																															
Atlanta	1,129	28.85	—.01	29.99	30.21	3	29.69	7	0.52	68.1	— 0.7	89.6	13	78.4	43.6	1	58.7	46.0	27.9	9	9.0	18	66.1	55.0	6.21	+ 3.00	7,091	sw.	32	w.	7	9	2	13	16
Pensacola	30	29.99	+.01	29.98	30.17	4	29.79	7	0.38	73.8	0.0	88.6	31	81.4	54.9	1	67.5	33.7	21.2	3	7.6	19	74.4	64.5	0.75	— 3.63	6,542	sw.	29	se.	18	2	2	13	16
Mobile	35	29.90	+.01	29.90	30.17	4	29.77	18	0.40	72.2	— 2.1	88.9	24	80.6	51.7	1	63.7	37.2	25.4	3	10.4	14	74.3	62.6	1.27	— 3.58	6,115	s.	28	se.	18	5	3	12	16
Montgomery	219	29.78	—.01	29.98	30.20	3	29.77	7	0.43	72.7	— 0.4	93.0	30	84.5	49.7	1	63.1	43.3	30.9	9	6.9	18	68.2	60.3	2.95	— 1.16	3,819	sw.	28	w.	15	6	3	13	15
Vicksburg	222	29.78	+.01	29.98	30.22	16	29.80	6	0.42	73.3	0.0	92.1	29	82.7	50.9	1	64.1	41.2	24.2	9	9.3	17	65.7	59.9	1.52	— 4.10	5,208	sw.	20	se.	21	4	2	15	14
New Orleans	52	29.96	+.03	29.98	30.17	16	29.83	30	0.33	72.6	— 2.4	90.7	31	82.1	57.4	18	65.7	33.3	21.7	31	8.8	15	73.9	62.7	3.07	— 2.47	4,577	se.	23	n.	30	6	3	13	15
Western Gulf States.																															
Shreveport	227	29.75	+.01	29.95	30.22	16	29.73	9	0.50	75.9	+ 2.5	101.2	31	89.6	53.9	2	65.4	47.3	30.2	22	10.8	1	64.7	61.7	0.08	— 5.04	4,514	s.	24	s.	12	2	2	9	20
Fort Smith	470	29.45	—.01	29.91	30.23	16	29.60	14	0.63	72.8	+ 5.5	97.7	31	85.6	48.0	16	60.8	49.9	33.8	2	13.5	5	76.6	63.9	0.38	— 3.60	2,671	sw.	14	nw.	14	4	3	14	14
Little Rock	299	29.64	—.01	29.91	30.22	16	29.60	14	0.62	72.6	+ 2.9	92.3	30	83.8	48.5	1	63.2	44.7	28.6	26	11.0	19	76.0	63.9	1.13	— 5.31	4,443	s.	23	sw.	29	5	5	17	9
Galveston	40	29.90	+.07	29.99	30.16	16	29.86	9	0.30	74.6	— 1.8	86.8	21	80.6	60.4	19	69.9	26.4	22.8	19	6.9	10	78.1	66.9	0.03	— 4.55	8,414	s.	30	nw.	18	2	5	12	14
Indianola	26	29.96	+.04	29.95	30.13	16	29.79	9	0.34	75.9	— 0.2	90.9	20	84.2	59.1	18	70.0	31.8	25.7	19	4.0	3	77.8	67.7	0.20	— 2.39	10,275	s.	40	e.	2	2	0	15	16
Palestine	533	29.46	+.03	29.98	30.21	16	29.77	9	0.45	73.8	+ 3.5	92.3	29	85.3	52.2	16	64.5	40.1	27.5	26	16.0	7	68.3	61.7	0.30	— 8.14	6,424	s.	26	s.	9	2	2	13	16
San Antonio	781	29.16	+.04	29.92	30.14	16	29.74	9	0.40	74.5	— 1.0	95.0	11	87.1	54.2	18	63.9	40.8	32.8	24	11.1	5	68.2	61.9	2.61	— 1.22	5,845	se.	28	n.	17	3	6	16	9
Rio Grande Valley.																															
Brownsville	57	29.92	+.07	29.93	30.09	18	29.72	1	0.37	75.5	— 3.5	89.9	20	85.1	58.2	18	68.4	31.7	29.1	19	9.2	15	82.9	69.1	6.57	+ 3.13	6,635	s.	27	s.	1	5	3	12	16
Rio Grande City	230	29.75	+.06	29.90	30.15	16	29.64	1	0.51	80.3	— 0.2	103.5	7	95.1	60.0	18	70.1	43.5	33.8	25	9.0	15	63.3	64.1	1.58	— 2.01	5,424	se.	18	se.	2	3	2	9	20
Ohio Val. & Tenn.																															
Chattanooga	783	29.29	—.01	29.99	30.23	23	29.63	7	0.61	67.4	— 0.7	91.0	13	78.5	46.7	3	57.7	44.3	32.5	9	5.1	18	70.3	55.9	5.63	+ 1.86	4,356	sw.	28	nw.	24	10	3	15	13
Knoxville	980	28.98	—.01	29.97	30.22	17	29.60	7	0.62	66.8	+ 0.4	88.5	13	77.0	43.9	7	56.5	44.8	32.7	9	5.3	7	75.1	57.7	4.92	+ 1.41	3,993	w.	27	sw.	28	14	4	20	7
Memphis	320	29.64	.00	29.96	30.25	17	29.69	14	0.56	71.5	+ 0.9	90.0	23	81.2	51.1	1	62.9	38.9	28.0	26	9.1	5	65.9	58.4	2.11	— 2.63	5,159	nw.	32	sw.	12	11	4	9	18
Nashville	549	29.39	—.03	29.94	30.22	17	29.66	7	0.57	68.1	— 1.3	91.2	13	79.2	44.7	3	58.5	46.5	32.5	3	9.1	5	68.9	56.3	2.10	— 1.49	4,773	nw.	32	w.	15	10	3	21	7
Louisville	551	29.38	—.03	29.94	30.29	17	29.60	14	0.69	67.6	+ 0.7	88.5	23	78.5	46.2	26	57.6	42.3	28.3	3	11.1	5	66.1	54.6	4.03	+ 0.08	4,484	s.	35	sw.	11	14	6	16	9
Greencastle	897	29.01	.....	29.93	30.30	17	29.52	14	0.78	63.4	.....	84.1	23	73.4	41.2	17	54.9	42.9	24.9	23	10.9	10	70.8	53.1	2.37	.....	4,264	s.	30	w.	14	12	4	18	9
Indianapolis	766	29.14	—.03	29.92	30.30	17	29.50	14	0.80	63.4	— 0.5	87.1	22	75.3	39.1	17	53.5	48.0	28.8	28	12.2	14	69.6	53.1	3.82	— 0.44	3,477	sw.	20	nw.	4	12	7	17	7
Cincinnati	628	29.30	—.03	29.94	30.30	17	29.62	14	0.68	65.2	— 0.1	85.9	22	75.1	44.5	17	56.2	41.4	26.5	13	9.4	7	68.3	53.6	4.11	+ 0.57	4,928	sw.	30	w.	12	11	4	16	11
Columbus	805	29.10	—.03	29.94	30.32	17	29.59	15	0.72	62.9	+ 0.1	84.6	22	73.2	40.8	16	52.3	43.8	29.3	21	11.9	5	72.9	53.4	7.67	+ 2.97	4,840	nw.	28	sw.	15	12	6	13	12
Pittsburg	766	29.12	—.05	29.92	30.31	17	29.62	15	0.68	62.8	+ 0.8	88.7	22	74.9	40.9	17	52.4	47.8	32.9	29	6.4	7	73.1	53.3	3.51	+ 0.73	3,938	nw.	25	ne.	24	13	7	19	5
Lower lake region.																															
Buffalo	690	29.19	—.04	29.92	30.32	17	29.50	15	0.82	53.1	— 0.5	76.6	14	60.8	39.0	17	46.4	37.6	27.0	12	6.6	27	78.2	46.0	4.69	+ 1.65	6,614	sw.	33	sw.	26	12	7	15	9
Oswego	335	29.55	—.07	29.91	30.28	17	29.58	27	0.70	52.3	— 2.2	75.7	29	60.3	37.2	17	44.4	38.5	28.9	29	6.8	25	70.9	42.5	1.92	— 0.90	6,709	w.	33	s.	15	8	8	13	10
Rochester	621	29.26	—.06	29.91	30.28	17	29.53	15	0.75	54.8	— 1.6	82.2	22	65.1	36.3	17	46.2	45.9	30.5	22	10.5	10	74.1	46.1	2.98	— 0.17	7,514	w.	32	nw.	26	7	7	16	8
Erie	681	29.21	—.01	29.92	30.31	17	29.49	15	0.82	55.8	— 1.7	77.0	14	64.2	37.2	17	47.0	39.8	27.0	13	9.6	1	67.7	44.5	1.48	— 2.18	5,983	sw.	26	e.	15	9	4	15	12
Cleveland	690	29.20	—.05	29.92	30.31	17	29.51	15	0.80	57.4	— 0.6	80.0	14	66.2	36.1	17	49.7	43.9	31.0	21	6.4	1	80.0	51.0	1.68	— 1.57	5,433	ne.	24	sw.	4	10	6	14	11
Sandusky	639	29.28	—.03	29.94	30.32	17	29.54	14	0.78	59.5	— 0.2	81.5	22	68.0	40.6	17	51.7	40.9	30.9	21	6.8	9	70.0	49.1	3.69	+ 0.15	7,791	sw.	35	nw.	16	13	5	16	10
Toledo	651	29.26	—.01	29.94	30.32	17	29.54	14	0.78	52.7	.....	86.3	22	70.0	37.8	8	49.5	48.5	32.5	31	8.7	7	63.4	45.9	4.50	+ 1.17	5,387	sw.	23	ne.	7	11	4	17	10
Detroit	661	29.24	—.04	29.92	30.29	17	29.55	14	0.74	58.4	+ 0.6	83.4	22	67.9	39.5	8	50.0	43.9	29.4	2	8.2	27	74.7	50.0	2.33	— 1.30	6,105	sw.	27	n.	13	13	5	18	8
Upper lake region.																															
Alpena	609	29.27	—.04	29.93	30.28	17	29.61	4	0.66	49.6	+ 0.9	83.0	29	61.0	*31.0	7	*40.9	52.0	38.2	19	*7.0	10	76.4	41.7	1.77	— 2.03	6,661	se.	20	nw.	24	12	7	14	10
Escanaba	608	29.27	—.02	29.93	30.24	16	29.59	28	0.65	50.0	+ 0.7	79.9	19	59.0	25.9	7	41.3	54.0	34.9	19	4.5	10	69.3	39.5	1.53	— 2.38	5,476	s.	24	nw.	4	17	8	19	4
Grand Haven	620	29.27	—.03	29.93	30.30	17	29.60	14	0.70	52.3	— 3.0	78.3	12	61.7	34.5	7	45.2	43.8	28.4	12	7.8	16	74.7	43.8	1.99	— 1.44	7,572	s.	34	s.	27	10	8	14	9
Mackinaw City	605	29.26	—.01	29.92	30.24	17	29.58	29	0.66	49.9	+ 4.3	76.1	22	60.1	32.5	7	40.7	43.6	36.0	19	4.2	9	70.4	39.8	1.01	— 1.89	6,611	w.	30	s.	21	9	4	20	7
Marquette	672	29.21	—.03	29.94	30.24	16	29.53	28	0.71	49.4	+ 0.3	86.7	21	60.9	27.5	7	39.5	59.2	44.1	21	6.2	10	65.9	37.0	1.17	— 1.82	6,093	nw.	32	nw.	4	11	8	15	8
Port Huron	633	29.26	—.03	29.93	30.30	17	29.55	15	0.74	51.4	— 1.6	80.9	22	61.5	33.1	16	42.8	47.8	30.3	21	6.9	25	75.6	43.3	4.29	+ 1.13	6,117	ne.	28	sw.	29	10	5	18	8
Chicago	661	29.25	—.01	29.94	30.30	17	29.58	9	0.72	57.0	+ 0.4	82.1	21	65.5	39.9	7	48.9	42.2	34.5	21	9.2	25	71.7	47.4	1.00	— 2.81	5,752	n.	22	nw.	6	10	5	14	12
Milwaukee	697	29.21	.00	29.95	30.28	17	29.70	13	0.58	54.3	+ 1.1	85.8	21	65.6	35.3	7	45.4	50.5	41.3	21	8.7	10	69.3	43.4	2.67	— 0.76	7,008	n.	33	n.	6	9	3	15	13
Duluth	672	29.20	—.03	29.94	30.24	16	29.58	29	0.67	52.2	+ 3.5	84.0	22	65.0	41.9	7	42.6	52.1	42.7	21	4.9	10	63.9	37.8	1.93	— 1.93	4,992	ne.	28	ne.	9	13	4	14	13
Extreme northwest.																															
Moorhead	923	28.93	—.02	29.91	30.19	24	29.58	20	0.60	56.4	+ 3.2	86.3	28	68.7	26.7	15	43.2	59.6	37.8	20	5.8	31	63.8	42.7	2.51	— 0.63	8,264	n.	44	s.	20	11	4	15	12
Saint Vincent	804	29.06	—.05	29.92	30.24	24	29.46	10	0.78	54.9	+ 3.8	83.2	28	68.8	22.0	15	40.3	61.2	41.0	18	10.8	13	74.5	46.3	1.53	— 0.82	7,211	nw.	35	w.	28	13	4	19	8
Bismarck	1,694	28.13	+.02	29.92	30.21	24	29.50	9	0.70	58.7	+ 3.8	91.8	20	72.5	30.2	2	46.5

Table of miscellaneous meteorological data for May, 1886—Signal Service observations—Continued.

Stations.	Elevation above sea-level.	Atmospheric pressure (in inches and hundredths).								Temperature of the air (in degrees Fahrenheit).														Mean rel. humidity.	Mean dew-point.	Precipitation.	Departure from normal.	Winds.				No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.				Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.				Monthly range.	Daily ranges.											Winds.							
					Highest barometer	Date.	Lowest barometer	Date.				Max.	Date.	Mean max	Min.	Date.	Mean min.		Greatest.	Date.	Least.	Date.					Total movement.	Prevailing direction.	Maximum velocity.							
																												Miles p. h.	Direction.	Date.					
Upper Miss. Valley.																																			
Saint Paul	831	29.01	+.01	29.91	30.24	16	29.56	13	0.68	59.5	+ 1.1	84.3	22	71.4	33.2	16	48.4	51.1	30.5	7	7.2	9	66.0	46.3	0.82	— 2.68	4,454	nw.	28	sw.	13	7	3	18	10
La Crosse	725	29.15	—.01	29.91	30.26	16	29.61	13	0.64	62.0	+ 2.3	84.0	22	71.5	39.8	16	53.0	44.2	28.6	28	8.5	6	67.7	51.1	0.89	— 2.47	5,024	nw.	32	nw.	13	9	1	17	13
Davenport	615	29.30	.....	29.94	30.29	17	29.53	9	0.76	62.4	+ 1.1	85.0	13	73.0	38.9	7	53.0	46.1	31.0	7	11.8	3	70.5	51.9	3.73	— 0.55	4, 503	sw.	36	s.	8	10	4	16	11
Des Moines	849	29.06	+.01	29.94	30.27	16	29.39	9	0.88	64.4	+ 3.5	93.6	21	77.3	37.4	16	54.6	56.2	33.8	28	9.2	6	70.3	53.6	4.01	— 1.52	2, 933	ne.	20	ne.	9	10	10	14	7
Dubuque	605	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...
Keokuk	618	29.28	—.01	29.92	30.27	17	29.49	9	0.78	64.1	+ 0.9	86.0	22	75.9	40.1	16	53.8	45.9	26.8	18	13.8	3	71.5	53.5	4.49	— 0.41	4,539	e.	26	e.	9	9	5	11	15
Cairo	359	29.59	—.02	29.94	30.26	17	29.62	14	0.63	68.7	+ 0.9	87.6	23	77.4	48.5	2	60.8	39.1	23.3	29	10.3	25	71.0	57.9	2.98	— 1.22	5, 899	n.	37	s.	10	13	7	16	8
Springfield	644	29.27	—.03	29.92	30.29	17	29.54	14	0.75	65.6	+ 2.2	85.8	23	75.4	42.9	16	54.6	42.9	29.5	21	10.9	3	67.4	53.9	3.56	— 1.84	5, 427	s.	36	nw.	9	9	7	15	9
Saint Louis	571	29.35	—.02	29.93	30.29	17	29.48	14	0.81	69.4	+ 3.5	89.8	23	78.2	46.6	2	60.5	43.2	26.3	14	13.0	11	71.7	59.1	7.84	+ 4.13	6, 890	s.	44	sw.	14	14	3	16	12
Missouri Valley.																																			
Lamar	1,028	28.88	.....	29.93	30.24	16	29.57	9	0.67	69.7	.....	90.4	29	81.7	44.4	1	58.6	46.0	32.1	16	15.2	10	68.5	57.4	3.59	.....	6, 513	s.	36	s.	14	4	1	15	15
Leavenworth	842	29.05	—.02	29.91	30.22	16	29.46	9	0.76	68.1	+ 3.5	92.5	26	81.0	43.0	1	57.1	49.5	31.2	25	12.5	4	73.7	58.4	4.71	— 0.41	4, 005	n.	36	e.	11	11	5	12	14
Omaha	1, 113	28.80	—.02	29.94	30.24	16	29.53	9	0.71	65.1	+ 2.9	92.9	21	77.9	41.0	16	54.1	51.9	37.8	20	9.1	2	64.6	51.1	4.58	— 0.40	4, 269	n.	29	n.	14	13	3	17	11
Valentine	2, 603	27.28	.....	29.91	30.17	2	29.57	9	0.60	61.0	.....	95.2	20	74.6	35.3	2	49.8	59.9	36.1	20	13.7	14	56.3	43.2	3.26	.....	8, 113	e.	54	e.	9	12	6	20	5
Huron	1, 307	28.56	.00	29.91	30 20	2	29.56	9	0.65	59.6	+ 6.2	96.5	20	74.2	32.0	4	46.4	64.5	48.0	20	14.8	14	74.7	50.9	1.58	+ 2.68	5, 548	nw.	27	sw.	13	12	3	20	8
Yankton	1, 234	28.64	+.02	29.92	30.23	2	29.49	9	0.74	62.3	+ 3.0	94.6	20	75.6	38.7	16	51.3	55.9	38.0	20	10.7	14	73.2	52.6	3.39	— 1.15	4, 705	n.	32	ne.	9	13	1	22	8
Northern slope.																																			
Fort Assinaboine	2, 720	27.12	.02	29.98	30.23	16	29.69	9	0.62	56.7	+ 4.0	94.7	23	71.7	25.7	1	43.0	69.0	46.3	23	11.3	10	46.3	34.1	0.99	— 0.50	8, 425	nw.	45	w.	20	4	2	20	9
Fort Benton	2, 681	27.18	.....	29.97	30.24	16	29.63	9	0.62	57.6	+ 3.7	94.5	24	75.0	27.4	13	43.7	67.1	47.4	23	18.4	10	66.4	44.6	0.36	— 2.24	2, 927	w.	25	e.	8	4	1	17	13
Fort Custer	3, 040	26.82	+.04	29.92	30.20	16	29.59	8	0.62	58.3	+ 3.7	96.0	24	75.0	27.9	2	44.1	68.1	44.5	18	16.5	1	52.3	37.5	0.56	— 2.19	5, 020	se.	30	n.	8	7	6	21	4
Fort Maginnis	4, 340	25.54	.....	29.95	30.21	16	29.61	9	0.63	53.4	+ 5.1	91.7	23	67.8	22.6	4	41.8	69.1	41.8	23	8.1	13	57.3	38.4	0.54	— 0.43	8, 242	n.	44	w.	20	13	7	19	5
Fort Shaw	3, 550	26.33	.....	29.94	30.20	16	29.62	8	0.58	55.1	+ 4.7	93.9	23	72.4	26.9	1	41.7	67.0	49.2	23	12.9	12	58.9	40.5	0.63	— 0.90	4, 796	w.	41	sw.	9	5	1	14	16
Helena	4, 069	25.53	+.02	29.95	30.22	16	29.61	8	0.62	54.9	+ 3.4	88.8	23	67.5	25.7	2	44.0	63.1	38.4	23	11.6	12	49.1	34.2	0.40	— 0.67	6, 219	sw.	32	n.	31	2	3	21	7
Poplar River	2, 030	27 81	.....	29.94	30.22	22	29.55	10	0.67	56.5	.....	93.5	24	72.8	23.0	1	42.6	70.5	46.1	29	14.0	31	65.5	43.1	1.35	— 0.12	6, 852	w.	41	w.	1	8	2	18	11
Deadwood	4, 600	25.39	+.05	29.91	30.15	23	29.58	8	0.58	54.7	+ 5.5	80.0	20	65.4	25.6	2	44.9	60.4	33.6	17	0.8	22	62.0	40.8	1.01	— 4.15	2, 180	sw.	16	sw.	12	8	3	16	12
Cheyenne	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...
North Platte	2, 841	27.06	+.04	29.91	30.17	16	29.57	8	0.60	63.0	+ 4.8	91.6	20	77.1	36.3	15	52.1	55.3	33.9	19	13.2	6	64.9	49.1	3.67	+ 0.57	6, 131	se.	32	se.	1	11	3	20	8
Fort Laramie	.....	.....	.....	.....	.....	...	.....	...	.....	61.4	.....	94.1	21	79.4	24.1	2	43.3	70.0	.....	...	.....	...	.....	.....	0.16	.....	.....	...	...	...	2	...	...	...
Middle slope.																																			
Denver	5, 294	24.77	+.07	29.92	30.19	16	29.61	8	0.59	61.0	+ 4.8	89.9	25	77.7	35.5	15	46.1	54.4	38.8	23	20.4	14	37.2	30.3	0.09	— 3.01	5, 600	s.	39	nw.	31	4	0	15	16
Pike's Peak	14, 134	27.94	.....	29.99	30.23	24	29.70	9	0.53	37.1	+ 5.3	46.0	25	34.8	8.0	14	21.5	38.0	19.1	7	8.0	14	76.0	20.6	0.40	— 3.79	14, 717	sw.	74	w.	5	7	1	9	21
West Las Animas	3, 899	26.07	+.09	29.90	30.16	23	29.54	8	0.61	65.6	.....	97.2	25	83.8	35.8	15	49.5	61.4	40.0	22	15.6	2	49.8	43.4	0.25	.....	6, 200	w.	44	ne.	2	3	1	17	13
Concordia	1, 384	28.47	.....	29.89	30.19	17	29.45	9	0.74	66.2	.....	93.0	22	79.7	40.2	15	54.3	52.8	33.9	19	10.4	2	71.9	55.6	4.65	.....	6, 163	ne.	32	n.	6	10	2	13	10
Dodge City	2, 517	27.38	+.05	29.90	30.20	17	29.51	9	0.69	67.5	+ 4.9	94.1	22	82.9	36.8	15	55.0	57.3	38.1	20	15.5	6	64.1	52.6	0.40	— 3.92	8, 319	n.	45	s.	4	5	4	11	16
Fort Reno	.....	.....	.....	.....	.....	...	.....	...	.....	73.4	.....	101.4	10	68.9	42.0	15	58.0	59.4	.....	...	.....	...	.....	.....	0.35	— 6.01	.....	...	...	...	...	...	...	...
Fort Supply	.....	.....	.....	.....	.....	...	.....	...	.....	71.3	.....	96.4	27	86.1	38.4	6	56.5	58.0	.....	...	.....	...	.....	.....	0.10	— 6.19	.....	...	...	...	7	...	...	...
Fort Elliott	2, 650	27.21	+.08	29.89	30.14	16	29.56	8	0.58	69.7	+ 7.2	96.0	29	84.2	43.0	15	56.1	53.0	39.0	22	16.5	14	52.2	47.7	0.23	— 5.66	7,855	se.	49	nw.	14	3	3	10	18
Southern slope.																																			
Fort Sill	1, 200	28.70	+.02	29.90	30.18	16	29.57	9	0.61	75.6	+ 6.5	103.5	31	90.1	46.7	15	61.4	56.8	36.5	28	16.5	17	50.3	52.4	0.07	— 5.02	7,625	s.	42	se.	14	1	1	6	24
Abilene	1, 745	28.17	.....	29.96	30.24	15	29.66	9	0.57	77.2	.....	104.7	12	91.2	50.3	15	64.9	54.3	35.2	19	17.0	16	49.1	53.3	0.33	.....	7, 854	s.	32	nw.	14	2	1	8	22
Fort Davis	4, 938	25.21	+.06	29.89	30.06	23	29.69	1	0.37	72.8	+ 4.7	97.7	13	89.5	41.7	17	56.8	56.0	40.5	3	21.6	14	36.4	30.3	0.17	— 1.42	5, 622	ne.	28	ne.	13	3	0	9	22
Fort Stockton	4, 010	26.97	+.06	29.94	30.19	17	29.73	13	0.40	76.7	+ 5.0	105.8	8	94.5	44.5	17	60.0	61.3	45.8	6	21.2	16	37.9	44.4	0.25	— 1.26	6, 927	se.	36	n.	14	1	0	5	26
Fort Stanton	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...
Southern plateau.																																			
El Paso	3, 764	26.21	+.07	29.85	30.10	17	29.66	1	0.44	76.8	+ 4.9	105.1	28	95.7	53.9	3	62.1	51.2	40.6	18	25.2	11	32.4	42.5	0.01	— 0.45	3, 067	w.	21	sw.	28	1	5	12	14
Lava	.....	.....	.....	.....	.....	...	.....	...	.....	72.1	.....	100.8	28	92.1	40.5	3	52.1	60.3	.....	...	.....	...	.....	.....	0.00	.....	.....	...	...	...	0	...	...	...
Santa Fé	7, 026	23.34	+.11	29.96	30.15	19	29.75	9	0.40	59.7	+ 4.1	82.7	24	73.5	34.0	15	47.7	48.7	33.3	8	11.0	13	30.8	26.2	0.21	— 0.68	5, 459	w.	32	n.	14	3	2	7	22
Fort Apache	5, 050	25.05	+.11	29.88	30.00	24	29.72	13	0.29	63.3	+ 6.1	96.3	25	85.8	33.0	1	42.6	63.3	52.7	19	29.0	13	31.6	28.2	0.00	— 0.66	5, 923	ne.	37	sw.	12	0	1	10	20
Fort Bowie	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...
Fort Grant	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...
Fort McDowell	.....	.....	.....	.....	.....	...	.....	...	.....	76.1	.....	115.5	25	98.2	42.0	10	54.0	73.5	.....	...	.....	...	.....	.....	0.00	.....	.....	...	...	...	0	...	...	...
Fort Thomas	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...
Fort Verde	.....	.....	.....	.....	.....	...	.....	...	.....	70.0	+ 1.6	102.5	24	90.2	37.0	15	49.9	65.5	.....	...	.....	...	.....	.....	0.02	— 0.33	.....	...	...	...	1	...	...	...
Maricopa	.....	.....	.....	.....	.....	...	.....	...	.....	83.1	.....	112.3	24	100.3	51.0	1	65.8	61.3	.....	...	.....	...	.....	.....	0.00	.....	.....	...	...	...	0	...	...	...
Phœnix	.....	.....	.....	.....	.....	...	.....	...	.....	75.1	+ 0.3	‡	25	99.8	40.3	9	50.4	‡	.....	...	.....	...	.....	.....	0.00	— 1.14	.....	...	...	...	0	...	...	...
Prescott	5, 389	24.77	+.10	29.89	30.02	19	29.74	10	0.29	61.9	+ 5.3	92.1	24	79.9	33.0	14	45.6	59.1	43.0	17	16.9	13	38.7	33.2	0.03	— 0.52	5, 942	sw.	37	sw.	12	2	1	10	20
San Carlos	.....	.....	.....	.....	.....	...	.....	...	.....	75.0	.....	108.4	24	90.5	44.0	1	53.5	64.4	.....	...	.....	...	.....	.....	0.00	— 0.44	.....	...	...	...	...	...	...	...
Willcox	.....	.....	.....	.....	.....	...	.....	...	.....	70.8	.....	105.0	23	95.2	32.0	14	46.3	73.0	.....	...	.....	...	.....	.....	0.00	.....	.....	...	...	...	0	...	...	...
Yuma	141	29.72	+.06	29.84	30.03	14	29.68	30	0.34	80.1	+ 3.0	108.4	18	97.0	54.5	4	64.8	53.4	41.4	18	15.9	13	42.3	51.4	0.00	— 0.05	4, 885	w.	32	w.	9	0	4	9	18
Middle plateau.																																			
Fort Bidwell	.....	25.40	.....	.....	.....	...	.....	...	0.39	53 6	.....	82.4	17	66.5	19.8	1	40.5	62.6	36.3	16	13.4	7	45.7	30.6	1.44	.....	3, 968	w.	20	w.	3	10	9	10	12
Winnemucca	4, 358	25.62	+.06	29.95	30.21	16	29.75	3	0.46	56.7	+ 3.3	83.1	17	73.4	19.7	2	38.8	68.4	47.3	2	19.6	8	29.4	21.3	0.14	— 0.79	6, 240	sw.	35	sw.	8	2	1	13	17
Salt Lake City	4, 348	25.63	+.05	29.94	30.23	16	29.71	3	0.52	61.4	+ 4.2	92.5	23	74.7	31.9	2	50.1	60.6	37.7	19	11.6	13	75.1	53.1	0.06	— 2.11	4, 534	nw.	28	nw.	8	1	4	15	11
Montrose	5, 825	24.33	.....	29.96	30.16	17	29.76	9	0.40	59.8	.....	89.5	24	76.2	35.1	14	45.7	54.4	38.9	19	17.7	13	37.9	29.8	0.57	.....	6, 319	se.	34	sw.	11	3	0	14	17
Fort Bridger	.....	23.55	.....	.....	.....	...	.....	...	0.52	49.1	.....	79.9	24	65.9	16.9	2	35.3	63.0	43.2	23	19.3	13	55.0	31.7	0.20	.....	6, 314	sw.	38	sw.	8	2	4	13	14
Northern plateau.																																			
Boisé City	2, 750	27.17	.....	30.01	30.30	16	29.80	3	0.51	59.1	+ 2.0	91.2	18	73.5	26.4	1	44.7	64.8	38.7	22	14.7	12	52.1	38.7	0.61	— 1.12	3, 122	nw.	20	nw.	8	4	1	15	15
Cœur d'Alene	.....	.....	.....	.....	.....	...	.....	...	.....	52.4	.....	86.0	25	66.6	24.0	7	38.2	62.0	.....	...	.....	...	.....	.....	1.56	— 0.42	.....	...	...	...	...	9	...	...	...
Ashland	.....	.....	.....	.....	.....	...	.....	...	.....	58.8	.....	90.0	18	73.5	25.0	1	44.0	65.0	.....	...	.....	...	.....	.....	1.19	.....	.....	...	...	...	9	...	...	...
Fort Klamath	.....	.....	.....	.....	.....	...	.....	...	.....	50.0	.....	81.0	18	65.6	13.0	1	34.3	68.0	.....	...	.....	...	.....	.....	1.12	.....	.....	...	...	...	6	...	...	...
Lake View	.....	.....	.....	.....	.....	...	.....	...	.....	54.0	.....	82.5	17	68.0	21.5	1	39.9	61.0	.....	...	.....	...	.....	.....	0.97	.....	.....	...	...	...	8	...	...	...
Linkville	.....	.....	.....	.....	.....	...	.....	...	.....	55.4	.....	84.1	31	69.8	23.7	1	41.1	60.4	.....	...	.....	...	.....	.....	1.37	.....	.....	...	...	...	8	...	...	...
Fort Spokane	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...
Spokane Falls	1, 909	27.95	+.01	30.01	30.25	16	29.75	26	0.50	58.6	+ 2.6	88.0	26	71.0	34.0	1	46.2	54.0	36.8	25	11.0	7	51.1	38.2	0.92	— 0.33	4, 324	w.	25	sw.	11	5	5	8	18
Walla Walla	.....	28.91	.....	.....	.....	...	.....	...	0.64	61.4	.....	90.6	26	75.3	35.6	3	49.8	55.0	44.4	22	16.1	8	45.1	37.8	0.67	.....	5, 177	sw.	40	sw.	8	4	3	16	12
N. Pac. coast region.																																			
Fort Canby	179	29.82	.00	30.02	30.34	20	29.71	22	0.63	52.1	.....	65.1	22	57.3	40.2	1	47.2	24.9	17.4	22	4.8	12	80.6	45.9	3.43	.....	7,472	w.	36	s.	8	16	12	13	6
Neah Bay	.....	.....	.....	.....	.....	...	.....	...	.....	51.6	.....	69.0	30	60.6	33.0	1	42.7	36.0	.....	...	.....	...	.....	.....	4.40	.....	.....	...	...	...	...	13	...	...	...
Olympia	36	30.01	+.01	30.05	30.37	15	29.74	22	0.64	54.2	+ 0.7	82.3	25	66.3	30.0	3	42.7	42.3	39.5	22	10.4	12	76.0	45.9	1.90	— 0.71	3, 000	s.	16	s.	14	12	10	10	11
Port Angeles	14	30.02	.....	30.04	30.36	15	29.73	26	0.63	49.0	.....	71.3	25	57.8	31.0	1	40.5	40.3	27.8	25	8.2	14	83.3	43.8	0.77	.....	3, 831	s.	20	w.	4	8	8	16	7
Pysht	.....	.....	.....	.....	.....	...	.....	...	.....	53.3	.....	73.0	22	63.7	33.0	2	42.9	40.0	.....	...	.....	...	.....	.....	1.81	.....	.....	...	...	...	14	...	...	...
Tatoosh Island	86	29.94	+.04	30.04	30.35	15	29.76	26	0.59	50.7	.....	61.8	26	56.5	39.2	1	46.7	22.6	14.5	22	5.0	11	83.4	45.7	3.44	.....	7,323	e.	37	ne.	4	20	13	15	3
Astoria	.....	.....	.....	.....	.....	...	.....	...	.....	53.2	.....	72.0	22	60.2	35.0	3	46.1	37.0	.....	...	.....	...	.....	.....	3.65	.....	.....	...	...	...	16	...	...	...
Portland	80	29.95	.00	30.04	30.35	15	29.72	22	0.64	57.7	+ 1.3	88.8	22	69.9	36.0	2	48.5	52.8	37.6	22	10.0	9	67.7	45.9	1.32	— 1.20	4, 130	nw.	21	s.	8	10	14	8	9
Roseburg	523	29.49	.00	30.05	30.34	1	29.73	22	0.61	50.7	+ 0.8	89.2	22	71.0	30.5	1	45.8	58.7	42.8	22	11.6	8	64.8	43.5	1.11	— 0.80	1, 673	nw.	17	se.	26	5	10	11	10
Mid. Pac. coast reg.																																			
Cape Mendocino	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...
Red Bluff	332	29.04	+.04	29.97	30.21	14	29.76	30	0.44	66.9	+ 0.1	94.7	17	78.8	45.6	2	54.7	49.1	33.6	21	8.8	7	57.2	49.0	0.73	— 0.40	5, 187	s.	26	se.	7	6	7	12	12
Sacramento	64	29.95	+.07	30.00	30.19	14	29.73	2	0.42	62.0	— 1.6	94.0	17	75.4	44.5	12	52.2	49.5	35.5	20	8.5	4	69.2	51.0	0.07	— 0.61	5, 467	sw.	27	nw.	1	2	2	6	23
San Francisco	60	30.00	+.06	30.05	30.24	14	29.85	2	0.38	57.8	+ 1.4	85.8	21	66.4	47.8	2	51.8	38.0	31.0	21	7.3	4	71.6	48.0	0.37	— 0.27	7, 583	w.	31	w.	29	3	5	11	15
S. Pac. coast region.																																			
Los Angeles	339	29.66	+ .07	30.01	30.16	6	29.89	2	0.26	62.4	+ 0.4	89.0	17	78.5	44.2	12	51.1	44.8	38.7	25	12.5	2	74.5	52.9	0.01	— 0.50	4, 285	w.	20	w.	16	0	3	14	14
San Diego	60	29.95	+.06	29.99	30.13	6	29.88	2	0.25	60.4	— 0.8	72.3	26	67.4	50.0	9	54.5	22.3	17.0	21	6.4	3	79.1	53.6	0.04	— 0.38	4, 883	nw.	21	nw.	26	0	3	19	9
San Luis Obispo	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...

• Record for 27 days. † Record for 30 days. ‡ 112°.2, record for 29 days. ‖ 71°.9, record for 29 days.

reports, that during the display telegraph wires worked badly and much difficulty was experienced in transmitting the midnight report.

Keokuk, Iowa: at 8.30 p. m. of the 8th, an auroral light of pale straw color was observed in the northern sky, extending from northeast to north-northwest, and rising to an altitude of thirty degrees at the centre. The light remained almost stationary, no changes being observed until 11.45 p. m. when it grew brighter, and flashes, resembling distant lightning, moved from the eastern to western extremity in rapid succession.

Rochester, New York: 8th, shortly after sunset greenish rays of light resembling the tails of comets were observed, reaching from the eastern horizon to several degrees beyond the zenith. About 9.00 p. m. a perfect corona formation was seen filling the northern heavens, with streamers converging at the zenith. At 11.00 p. m., fringes of light extended east and west nearly covered the whole southwest sky, the aurora quivering simultaneously with rapid pulsations which were clearly seen directly overhead. At 11.15 p. m. two arches were seen, one being a brilliant blue, the other a dull orange color. The display ceased early on the following morning.

Buffalo, New York, 8th: a beautiful aurora was observed from 8.30 to 11.45 p. m., consisting of an arch of pale yellow light, from which luminous beams shot upward with a tremulous motion, reaching the zenith and occasionally travelling along the arch like large waves. The centre of the arch appeared to be about 15° above the horizon; the display was most brilliant about 9.30 p. m.

Philadelphia, Pennsylvania: an aurora was observed from 11 p. m. until 3.30 a. m. on the night of the 8–9th. It first appeared as a diffuse white light; frequent slender beams arose from the northern horizon to a height of 33°; at 1.30 a. m. the aurora took the form of an arch, with the lower edge sharply defined; altitude of arch about 10° and azimuth between 130° and 210°. Luminous beams shot upward from the arch and moved toward the east.

Syracuse, New York: on the night of the 8–9th a brilliant auroral display was observed. It first appeared as a cloud, from which would burst luminous patches like smoky flames, or illuminated fog. A dark segment rose about 40° above the northern horizon from which many streamers were seen to rise and extend beyond the zenith.

Ithaca, New York: an aurora was observed from 8.30 p. m. to 1 a. m. on the night of the 8–9th. It first appeared in the form of a bright arch of white light about 20° above the horizon, with streamers extending at intervals to the zenith. The arch gradually descended, and faded away at 10° above the horizon. The display was faint at 10 p. m., but at 11 p. m. it revived and continued quite brilliant until 1 a. m.

Grampian Hills, Clearfield county, Pennsylvania, 8th: an auroral display appeared at 8.25 p. m., increasing in brilliancy until 9.30 p. m., when it had reached its maximum. A dark segment or arch, 25° high, extended from northeast to northwest. Bright streamers shot up from the bow of the arch and ascended nearly to the zenith; these streamers appeared at all points of the arch and continued until 10.30, when all seemed to blend into a general light. The phenomenon disappeared at 11 p. m.

Wytheville, Wythe county, Virginia: at 11 p. m. of the 8th, an aurora was distinctly seen extending from the east to the west.

Parkersburg, West Virginia, 8th: an aurora, extending from northeast to southwest, was observed at 9.30 p. m., and continued until 3 a. m. of the 9th.

Oswego, New York: a brilliant aurora began at 9.20 p. m. of the 8th. An arch formed at 10 p. m., extending from 20° west to 20° east of north, and having an altitude of 25°. Streamers of straw-colored light passed rapidly from the horizon to the zenith. The display reached its greatest brilliancy at 10 p. m., and disappeared early on the 9th.

Washington, City: at 9.40 p. m. of the 8th a faint aurora was observed. After 12.30 a. m. of the 9th it became much brighter and aassumed the form of an arch, the lower edge of which was well defined, and constantly rose and fell; the upper edge was very indistinct. The highest point of the segment was apparently four degrees west of the magnetic meridian. At 3 a. m. the arch had become almost imperceptible; the aurora became fainter, with an occasional diffuse streamer shooting upward to an altitude of thirty degrees; this continued until 4 a. m. when the aurora had gradually disappeared.

Capt. W. Rea, of the s. s. "Bassano," makes the following report relative to an auroral display observed on the night of the 8–9th, in N. 40° 24′, W. 60° 40′: "The northern lights had been showing for two hours, when they increased to an immense size, shining up and darting about in cloven-tongue shape. Immediately over the mast heads was one solid arch of light stretching from the eastern to the western horizon. The tongues joining this arch resembled half a wheel. There also appeared to be minor branches shooting up from the arch. The whole of this display showed a brilliant light and was an imposing spectacle."

Walla Walla, Washington Territory: on the 9th at 2 a. m. a bright aurora was observed situated between 165° and 190° azimuth. When first seen it appeared as a sheet of pale green light resting upon the horizon and extending to an altitude of 8°, with streamers which were constantly in motion.

Atlantic City, New Jersey: from 3.00 to 3.30 a. m. of the 9th, an aurora was observed, extending from north-northwest to northeast, having an altitude of fifteen degrees, with several large streamers reaching nearly to the zenith.

Albany, New York: shortly after midnight on the morning of the 9th an aurora was observed. It consisted of an arch having an azimuth of 150° to 190° and 15° altitude. The aurora was a pale straw color tinged with greenish light.

Huron, Dakota: a brilliant aurora, of constantly changing form, was observed from 8.30 p. m. of the 9th until after midnight. At times an arch would extend from northwest to east, and then change into innumerable waving beams of light, which extended to an altitude of 45°.

Sitka, Alaska: about 1 a. m. of the 9th, a dark segment of a circle, with a faint glow on its outer edge, was noticed in the southwest, covering fully one-third of the horizon. Suddenly, at 1.40 a. m., very brilliant flashes of green tinted light shot up from a point about 15° above the light rim of the dark segment, and converged in a point near the zenith. This continued until 1.55 a. m., when the rays instead of disappearing at the zenith seemed to discharge themselves into a peculiarly shaped cloud of light. At 2 a. m. the beams of light appeared to run together and form curtains of moving light, with a rapid lateral movement from the east to west. The curtains of light gradually increased in brilliancy until they nearly eclipsed the light of the moon. At 2.10 a. m. the aurora began to move slowly toward the northern horizon, the curtains moving from the southwest to the north, and began to fade away, but the auroral glow did not disappear until 4.45 a. m.

Gardiner, Kennebec county, Maine: a faint auroral light was observed at 9 p. m. of the 9th. At 10 p. m. it had assumed the form of an arch above a dark cloud. The aurora was very brilliant at 11 p. m.

Bismarck, Dakota: an aurora was seen from 11.15 to 11.50 p. m. of the 13th. Flashes of pale green light extended from azimuth 185° to 225°, shooting up to an altitude of 25°.

Marquette, Michigan: at 10.20 p. m. of the 14th, broad, faint beams of auroral light were observed in the northern sky, reaching almost to the zenith.

Fort Assinaboine, Montana: a faint aurora was observed in the north about 11.20 p. m. of the 20th, consisting of a pale, whitish colored arch about 12° to 15° altitude and 90° azimuth.

Saint Paul, Minnesota: a faint aurora was observed from 10.30 to 10.50 p. m. of the 30th; it appeared as a faint glow, 2° to 6° in width, hanging over a hazy segment 20° in altitude at the centre.

Auroral displays were also observed during the month, as follows:

1st.—Eastport, Maine; Alpena, Michigan; Poplar River, Montana.

2d and 5th.—Kent's Hill, Maine.

7th.—Windsor, Illinois.

8th.—Erie and Philadelphia, Pennsylvania; Fort Totten, Vermillion, and Webster, Dakota; Vevay and Spiceland, Indiana; Fort Madison and Bancroft, Iowa; Fallston, Maryland; Genoa, Nebraska; Princeton, North Volney, Factoryville, Syracuse, and Palmyra, New York; Statesville, North Carolina; Jacksonborough, North Lewisburg, Garrettsville, and Hiram, Ohio; Variety Mills, Virginia.

9th.—New Haven, Connecticut; Eastport, Maine; Cleveland, Ohio; Erie, Pennsylvania; Webster, Dakota; Fort Madison, Iowa; Allison, Kansas; Cambridge and Heath, Massachusetts; Nashua, New Hampshire; Le Roy, New York; Dale Enterprise, Virginia.

10th.—Moorhead, Minnesota.

11th.—Poplar River, Montana.

12th.—Eastport, Maine.

13th.—Fort Madison, Iowa; Manitowoc, Wisconsin.

17th.—Eastport, Maine; Chicago, Illinois; Fort Totten and Webster, Dakota.

20th.—Bismarck, Fort Totten, and Webster, Dakota; Moorhead, Minnesota.

21st.—Eastport, Maine; Moorhead, Minnesota; Webster, Dakota.

22d.—Quakertown, Pennsylvania.

23d and 24th.—Poplar River, Montana.

25th.—Vevay, Indiana.

26th.—Eastport, Maine.

28th.—Moorhead, Minnesota; Charlotte, Vermont.

29th.—Poplar River, Montana; Fort Madison, Iowa.

30th.—Poplar River, Montana.

CHART OF ELECTROMETER READINGS.

The first diagram of chart vi shows some of the results of simultaneous observations made at the Smithsonian Institution and at the office of the Chief Signal Officer. The distance between the two stations is slightly over one mile. The exposure at the office is that described in the MONTHLY WEATHER REVIEW for April. That at the Smithsonian Institution is from the north window of a tower on the north side of the building, the height of the collector above the ground being about fifty feet. The diagram shows observations made at both stations during the passage of a thunder-storm on June 14th.

The following notes were made at the Smithsonian Institution during the observations:

Date and time.	Remarks.
June 14, 1886, 11 a. m.–12 m.	Morning very oppressive, and during the forenoon showery and sultry; wind w., backing to sw., coming in light puffs; cloudy.
12.35 00 p. m.	Wind s. by e.
1.02 00	Very light rain began; ended in few seconds.
1.09 00	Distant thunder; cloudy, and heavy cu.-strat. clouds in west.
1.13 25	Thunder.
1.16 20	
1.17 40	
1.17 00	Rain began; ended in few seconds; began again 1.20 15, very light; ended 1.22 00.
1.22 20	Distant thunder.
1.32 00	
1.27 30	Rain began; wind sw., light; rain ended 1.39 20.
1.45 00	Wind w., and clearing weather.
	Rain began 1.58 00, ended 1.59 45; began 2.01 00; very heavy cloud overhead.
2.45 00	Wind ssw., light; clearing here but dark and threatening in northwest; apparently storm is not more than ten miles away.
3.05 00	Wind calm; storm now overhead.
3.03 15–40	Thunder, at these times, the last figures giving times when no longer audible; wind w. by n., light.
3.07 30–42	
3.09 10–13	
3.10 08–10	
3.15 30–32	
3.17 30	
3.23 10–15	
3.26 15–18	
3.28 00–01	
3.33 30–33, sharp.	
3.42 45–46	
	Rain began 3.43 20; ended 43 50; heavy rain began 3.46 00.
3.50 00	Wind, in gusts, from w; thunder 3.52 45; rain, light, 3.55.
4.02 24–26	Rain ended 4.13, wind changing from n. to w.; peculiar cloud appearance in n. and ne. horizon.
4.04 45	
4.06 20	
4.06 25–29	
4.08 10–12	
4.09 58 to 4.10 00	
4.11 14–15	
4.15 55	
4.20	Wind light, from w.; few ci.-strat. clouds; clear in nw.; storm evidently over.

In the second diagram is exhibited the result of observations made at New Haven, the first part showing the observed potential of the atmosphere on April 6th during a heavy rain, with high northeast wind, but unaccompanied by the characteristics of a thunder-storm. The second part shows the record made at the same station during a thunder-storm on April 24th.

The last diagram of the chart exhibits the results of simultaneous observations at the Smithsonian Institution and at the office of the Chief Signal Officer on June 11th. On that day the sky was clear in the morning, the weather was warm, and cumulus clouds appeared in the afternoon. It is selected as a day on which no special electrical activity took place or was to be expected. It shows that under such conditions two stations, one mile apart, are subjected to influences producing limited variations quite independent of each other; while the first diagram shows that violent disturbances produce fluctuations sensibly the same at both points. The observations from which these curves are drawn are made at intervals of five minutes, except during violent fluctuations when they are often reduced to two minutes, and often to one minute.

The following notes are abstracted from the report of the observer at the Ohio State University, Columbus, Ohio, and contain interesting examples of the appearance of negative potential some time in advance of a thunder-storm or rain:

The potential of the air was negative during the snow storm of April 6th, and negative before rain on April 26th and 29th. The rest of the month it was positive, and ranged between 7 and 175 volts.

On May 4th the potential was negative nearly all day, varying from 10 volts, positive, to 63, negative. Rain fell on the morning of the 5th; negative indications on this date. On May 10th, 11th, 12th the potential was negative all the time from 5 to 40 volts. Thunder storm on the night of 10th; rain on 11th; thunder storms on nights of 12th and 13th. The potential was negative on the 14th, ranging from 5 positive to 30 volts negative; a thunder storm occurred during the night of the 15th. On May 25th the potential was negative, 10 volts, at 11 a. m.; a thunder storm occurred at 7 p. m. On May 27th a thunder storm passed to the west of the station at 2 p. m., but no rain occurred. For that day the readings were: 10 a. m., 69 volts; 12 m., 50 volts; 1.45 p. m., 25 volts; 2 p. m., —22 volts; 2.10 p. m., —12 volts; 2.20 p. m., —23 volts; 2.30 p. m., —5 volts; 4 p. m., 6 volts. During the rest of the month the potential was positive. The maximum was 120 volts positive, and occurred on the 26th.

THUNDER STORMS FOR MAY, 1886 (by Jr. Prof. H. A. Hazen).

The total number of storms reported was 2,734. Voluntary observers reported 765, special thunder-storm observers, 1,571, and Signal Service observers, 398. The following table shows the number of storms on each day by states and districts. The days of greatest frequency was the 12th, 22d, 23d, 24th, and 14th, and of least frequency, the 1st, 2d, 16th, 17th, and 19th. The storms of the 11th and 12th accompanied the destructive storms of those dates in Kansas and Ohio:

Thunder-storms by districts, May, 1886.

District.	State.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	Total.
I	Connecticut	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	3	.....	.....	.....	.....	.....	.....	.....	6	5	20
	Maine	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	6	.....	2	1	1	.....	1	.....	.....	.....	7	.....	21
	Massachusetts	.....	1	.....	1	5	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	16	.....	2	.....	.....	.....	.....	.....	.....	.....	8	8	43
	New Hampshire	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	2	.....	2	.....	1	.....	.....	.....	.....	.....	5	.....	12
	New York	.....	.....	.....	9	3	.....	.....	.....	.....	2	1	.....	6	1	6	.....	.....	.....	.....	4	.....	8	.....	.....	.....	.....	.....	.....	.....	2	.....	42
	Rhode Island	.....	.....	.....	.....	2	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	1	.....	.....	.....	.....	.....	.....	.....	.....	4	10
	Vermont	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	3	.....	3	.....	1	.....	.....	.....	.....	.....	2	1	11
	Total	.....	1	.....	10	15	.....	.....	1	.....	3	1	2	7	1	7	.....	.....	.....	1	35	1	21	1	3	.....	1	.....	.....	.....	30	18	159
II	Delaware	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Maryland	.....	.....	1	.....	3	9	6	.....	.....	10	7	2	5	4	8	.....	.....	.....	.....	1	.....	10	5	3	2	.....	5	.....	.....	.....	3	84
	New Jersey	.....	.....	.....	1	4	5	5	1	.....	3	2	2	.....	.....	.....	.....	.....	1	.....	5	1	11	4	5	.....	.....	7	.....	.....	.....	4	61
	North Carolina	.....	.....	.....	1	1	4	1	.....	.....	.....	.....	2	.....	.....	4	.....	1	3	3	1	2	3	7	10	1	1	3	5	.....	4	7	63
	Pennsylvania	.....	.....	.....	2	5	.....	2	.....	1	5	3	5	1	.....	2	1	.....	.....	.....	7	1	14	7	4	.....	.....	6	.....	.....	2	2	70
	Virginia	.....	.....	.....	.....	.....	11	11	1	1	1	9	9	13	11	12	.....	1	1	1	4	.....	6	10	7	4	.....	10	.....	.....	5	11	139
	West Virginia	.....	.....	.....	.....	1	1	.....	.....	.....	2	2	3	3	.....	1	.....	.....	.....	.....	.....	1	3	.....	1	1	.....	.....	.....	.....	.....	1	30
	Total	.....	.....	1	3	13	27	28	3	2	21	23	23	22	15	27	1	2	5	4	18	5	47	33	30	8	1	31	5	.....	11	28	437
III	Illinois	2	.....	6	5	5	9	1	6	22	11	10	9	5	11	2	.....	.....	.....	1	.....	.....	4	8	1	1	.....	3	.....	6	2	.....	130
	Indiana	2	1	.....	6	1	5	.....	1	9	16	10	23	7	13	2	.....	.....	.....	.....	1	.....	4	17	4	.....	.....	3	.....	1	4	.....	130
	Kentucky	.....	.....	.....	.....	1	4	1	.....	.....	2	3	.....	1	1	.....	.....	.....	.....	.....	2	.....	1	2	2	.....	.....	2	.....	.....	.....	.....	27
	Ohio	2	1	1	27	21	13	3	2	10	53	54	127	45	83	26	.....	3	.....	3	2	4	111	150	143	9	19	68	7	2	37	6	1,032
	Tennessee	1	.....	.....	.....	3	7	2	.....	.....	1	.....	.....	.....	3	4	.....	.....	.....	4	5	0	1	1	8	.....	.....	3	4	5	8	.....	66
	Total	7	2	7	38	31	38	7	9	41	83	77	159	58	111	34	.....	3	.....	8	10	10	121	178	158	10	19	79	11	14	51	6	1,380
IV	Michigan	3	.....	.....	.....	.....	1	.....	.....	4	.....	1	11	3	7	1	.....	.....	.....	.....	.....	3	2	4	.....	.....	15	3	.....	1	.....	.....	59
	Minnesota	.....	.....	1	.....	.....	.....	.....	1	2	1	2	2	1	.....	.....	1	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	1	.....	14
	Wisconsin	1	.....	.....	1	1	1	.....	2	2	1	.....	2	5	1	2	.....	2	2	.....	.....	3	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	27
	Total	4	.....	1	1	1	2	.....	3	8	2	3	15	9	8	3	1	2	2	.....	.....	6	3	6	.....	.....	15	3	.....	1	1	.....	100
V	Dakota	.....	.....	1	.....	.....	1	2	4	2	.....	5	4	2	.....	.....	3	1	.....	.....	3	3	1	.....	1	2	1	1	3	1	4	5	50
	Iowa	.....	.....	5	1	2	3	2	11	18	2	1	25	30	13	1	.....	1	25	2	2	15	44	15	1	33	10	1	17	21	11	3	315
	Nebraska	1	1	6	2	4	5	2	2	4	1	3	4	.....	3	.....	1	.....	.....	.....	.....	.....	4	3	.....	1	1	1	1	8	8	2	68
	Total	1	1	12	3	6	9	6	17	24	3	9	33	32	16	1	4	2	25	2	5	18	49	18	2	36	12	3	21	30	23	10	433
VI	Arkansas	.....	.....	.....	.....	1	1	.....	.....	2	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	1	.....	.....	2	.....	.....	.....	1	1	2	1	1	16
	Indian Territory	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Kansas	1	7	9	11	3	11	1	4	1	.....	17	1	11	12	.....	14	.....	.....	.....	.....	.....	4	8	2	1	.....	2	5	6	12	1	144
	Missouri	.....	.....	1	2	5	6	1	2	4	1	7	.....	1	8	.....	1	1	.....	.....	.....	.....	.....	8	.....	.....	.....	2	.....	5	6	4	65
	Total	1	7	10	13	9	18	2	6	7	1	24	1	12	23	.....	15	1	.....	.....	1	.....	4	18	2	1	.....	5	6	13	19	6	225
	Grand total	13	11	31	68	75	94	43	39	82	113	137	233	140	174	72	21	10	32	15	69	40	245	254	195	55	48	121	43	58	135	68	2,734

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories during the month, as follows:

Alabama.—6th, 16th, 28th.

Arizona.—5th, 11th, 12th, 21st, 24th, 29th.

British Columbia.—19th.

California.—1st, 2d, 5th, 6th, 10th, 11th, 12th, 21st, 22d, 23d, 25th to 29th.

Colorada.—5th, 15th, 18th.

Connecticut.—1st, 6th, 7th, 9th, 18th, 23d.

Dakota.—1st, 16th, 19th, 22d.

District of Columbia.—10th, 12th, 20th.

Florida.—4th, 7th, 15th, 17th, 18th, 23d to 26th, 28th.

Georgia.—17th.

Idaho.—3d, 5th, 10th, 14th, 28th.

Illinois.—2d, 6th, 8th, 11th, 13th, 14th, 16th, 17th, 21st, 23d, 30th.

Indiana.—3d, 4th, 8th, 17th, 24th, 25th, 26th, 30th.

Iowa.—2d, 4th, 10th, 11th, 16th, 17th, 25th, 27th, 29th, 30th, 31st.

Kansas.—3d, 12th, 13th, 16th, 31st.

Kentucky.—17th.

Maine.—7th, 10th, 24th.

Massachusetts.—1st, 6th, 7th, 10th, 13th, 14th to 15th, 18th, 19th, 20th, 27th, 30th.

Michigan.—7th, 8th, 13th, 23d, 29th.

Minnesota.—20th.

Missouri.—17th.

Montana.—4th, 8th, 22d.

Nebraska.—20th, 22d.

Nevada.—2d, 21st, 25th, 29th.

New Hampshire.—10th.

New Jersey.—1st, 9th, 14th, 18th, 29th, 31st.

New Mexico.—15th.

New York.—1st, 3d, 4th, 7th, 8th, 9th, 14th, 17th, 18th, 21st, 29th.

North Carolina.—19th.

Ohio.—3d, 5th, 7th, 8th, 11th, 12th, 14th, 17th, 18th, 22d, 24th, 31st.

Oregon.—1st, 2d, 3d, 15th, 16th, 22d, 25th.

Pennsylvania.—2d, 7th, 14th, 17th, 18th, 23d, 24th.

Rhode Island.—7th, 18th, 27th.

South Carolina.—4th.

Tennessee.—3d, 5th, 12th, 13th, 14th, 17th, 18th, 29th.

Texas.—12th, 17th.

Vermont.—7th, 24th.

Virginia.—5th, 6th, 11th to 14th, 17th, 18th, 24th, 30th.

Washington Territory.—2d, 6th, 15th, 18th, 19th, 25th, 30th,

Wisconsin.—4th, 11th, 12th, 16th, 17th.

Wyoming.—3d, 7th, 10th, 12th, 13th, 15th, 24th, 28th.

LUNAR HALOS.

Lunar halos were observed in the various states and territories, as follows:

Alabama.—16th, 17th.

Arizona.—9th, 10th, 12th.

Arkansas.—12th, 13th.

California.—11th, 13th, 14th, 18th, 21st, 22d.

Colorado.—12th.

Dakota.—11th, 16th.

District of Columbia.—7th, 17th, 18th.

Florida.—14th, 15th.

Atlanta.—14th.

Illinois.—10th, 12th, 13th, 17th, 19th, 27th.

Indiana.—8th, 9th, 13th, 16th, 17th, 18th.

Iowa.—10th, 12th, 13th, 14th, 16th.

Kansas.—10th to 13th.

Kentucky.—10th, 13th, 17th.

Louisiana.—15th, 16th.

Maine.—7th, 10th, 13th, 18th, 26th.

Massachusetts.—13th, 16th.
Michigan.—9th, 13th, 14th, 15th, 21st.
Minnesota.—11th, 12th.
Missouri.—12th.
Montana.—14th, 16th.
Nebraska.—10th, 12th, 13th, 14th, 17th.
New Hampshire.—13th.
New Jersey.—10th, 13th.
New York.—7th, 9th, 11th, 13th, 18th.
Ohio.—8th, 9th, 13th, 17th.
Oregon.—12th, 15th, 17th.
Pennsylvania.—13th, 17th.
Rhode Island.—9th, 10th, 14th, 18th.
Tennessee.—8th to 11th, 14th, 16th, 17th, 30th.
Texas.—10th, 11th, 12th, 15th, 16th.
Vermont.—3d, 17th, 18th.
Virginia.—11th, 12th, 13th, 17th.
Washington Territory.—16th.
West Virginia.—8th.
Wisconsin.—12th, 13th, 14th, 16th, 23d.

The phases of the moon during May, as given in "The American Ephemeris and Nautical Almanac" for 1886, are as follows: new moon, 3d, 10 h. 34.3 m.; first quarter, 10th, 9 h. 12.4 m.; full moon, 17th, 8 h. 38.9 m.; last quarter, 25th, 6 h. 27.9 m.; apogee, 24th, 6.2 h.; perigee, 5th, 5.7 h. (Washington mean time).

MIRAGE.

Oswego, New York: on the afternoon of the 9th, Stony and Duck Islands, which ordinarily are invisible from Oswego, were plainly seen and at times appeared inverted, when the tops of trees seemed to touch. The same phenomenon was also observed on the 14th.

Traverse City, Michigan, 16th.

Reidsville, North Carolina, 25th.

Parkersburg, West Virginia, 10th, 11th, 12th.

Duluth, Minnesota, 2d, 3d.

Indianola, Texas, 22d to 26th.

Webster, Dakota, 1st, 2d, 5th to 8th, 10th, 11th, 12th, 14th, 15th, 16th, 18th, 21st to 25th.

MISCELLANEOUS PHENOMENA.

SUN SPOTS.

Prof. David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for May, 1886:

Date—May, 1886. Standard time.	No. of new.		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
2, 11 a. m...	1	30‡	.....	.....	1	30‡	5	95‡	
3, 4 p. m...	0	15‡	0	0	.....	.....	3	110‡	
4, 9 a. m...	0	0	0	0	0	0	3	100‡	
5, 6 p. m...	.....	.....	.....	.....	0	0	4	100‡	
9, 10 a. m...	0	40‡	.....	.....	0	0	2	130‡	
12, 6 p. m...	3	10‡	.....	.....	0	0	4	25‡	
14, 12 m	0	0	.....	.....	0	0	1	8	
16, 1 p. m...	0	0	.....	.....	0	0	0	0	
17, 8 a. m...	0	0	0	0	0	0	0	0	
19, 9 a. m...	1	3	0	0	0	0	1	3	
20, 3 p. m...	0	0	0	0	0	0	1	3	
23, 9 a. m...	1	6	0	0	.....	.....	2	9	
28, 6 p. m...	2	3	.....	.....	.....	.....	4	8	
30, 10 a. m...	1	30‡	.....	.....	0	0	4	40‡	

Faculæ were seen at the time of every observation. ‡Approximated.

Mr. H. D. Gowey, of North Lewisburg, Champaign county, Ohio, reports having observed sun spots on the following dates: 2d, 3d, 4th, 6th, 7th, 8th, 11th to 14th, 19th, 20th, 21st, 25th to 31st.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and fifty-six stations show 4,835 observations to have been made, of which four were reported doubtful; of the remainder, 4,831, there were 4,257, or 88.1 per cent., followed by the expected weather.

DROUGHT.

Abilene, Texas: a drought of great severity has extended over this part of Texas during the present spring. Cattle have died in some places in large numbers from the want of water. The prairies look brown, the grass being dried by the heat. Farmers report that crops of all kinds are a failure.

Midland, Midland county, Texas: from November, 1885, until May 31, 1886, the total precipitation was only 1.33 inches. The result is bad both for stockmen and farmers; many sheep have died from want of water; seventy-five per cent. of the lambs have perished.

Indianola, Texas, 31st: at the close of the month streams were drying up and fish dying; stock were driven nine and ten miles for water and were perishing in large numbers from lack of water and food.

Palestine, Texas, May 31st: the continued hot and dry weather of May has injured, and in places entirely killed the crops of Anderson county. Very little rain fell during the month.

The following is taken from the New York "Daily News" of May 27th:

FORT WORTH, TEXAS, *May* 27.—The unprecedented drought throughout north and west Texas continues. Reports received from forty-eight counties in the dry section show the crops to be almost entirely a failure. In many counties there will hardly be corn enough raised to replace the seed, while in others the wheat and oat crops are entire failures. The oldest settlers say this is the longest drought for this season known in the history of Texas. In most counties there is no grass at all, and stock water is getting very scarce. The range is not as good now as it was in January and February last. In regard to the mortality of cattle on the trails and the great ranches of the West, little that is authentic can be obtained. Reports agree, however, that the plains are covered with dead carcasses, and that hundreds of animals are dying daily of starvation and thirst. Many herds are too weak to be driven to water.

Fort Sill, Indian Territory, 31st: post gardens destroyed by drought and cattle grazing seriously injured.

Wellington, Sumner county, Kansas: it is estimated that the drought which prevailed in this vicinity during May will reduce the wheat and oat crops 25 per cent. below the average.

Elk Falls, Elk county, Kansas: only 0.40 inch rain fell at this place during the month. Crops in this part of the state were suffering from drought at the close of the month.

Shreveport, Louisiana: at the close of the month this town and the surrounding country was suffering from lack of rain. The soil was so hardened by heat and want of moisture as to render ploughing very difficult. The total rainfall for May was only 0.08 inch. The Red River was several feet lower than it has been in any May since establishment of the Signal Office at Shreveport.

Liberty Hill, Bienville parish, Louisiana, 31st: very little rain has fallen during the past six weeks. Cotton and oats have been considerably injured by the drought.

Milledgeville, Georgia: crops in this vicinity were suffering from drought until the 18th, when considerable rain fell.

Savannah, Georgia: on the 20th rain fell, which was much needed, none having fallen for three weeks. Crops were suffering from drought.

Hay Springs, Sheridan county, Nebraska: during the first twenty-eight days of the month only 0.37 inch of rain fell.

Charleston, Coles county, Illinois, 31st: ground dry and hard; rain much needed.

Saint Paul, Minnesota, 31st: vegetation in this vicinity is looking much stunted, and the country is beginning to suffer from drought.

The following is from the New York "Telegram" of June 3, 1886:

MINNEAPOLIS, Minnesota, June 1.—Crop prospects in the Northwest are not quite as favorable as a week ago. With the exception of the April rains, which came when seeding was about half completed, the weather has been dry and complaints are becoming numerous that grain is suffering for want of moisture.

Fort Bridger, Wyoming Territory, 31st: the rainfall of the 29th and 30th, 0.20 inch, was the only appreciable precipitation

during the month, and was greatly needed to revive the pasturage of this region.

Erie, Pennsylvahia, 31st: but little rain fell in this part of the state during May and crops were damaged.

EARTHQUAKES.

Trimble, Athens county, Ohio: at 9 p. m. of the 2d, a slight shock of earthquake, of a second's duration, was felt. This slight earthquake was felt in a district bounded by New Lexington, Perry county, Lancaster, Fairfield county, Circleville Pickaway county, Chillicothe, Ross county, Wellston, Jackson county, Pomeroy, Meigs county, and Parkersburg, West Virginia, being a circular area some seventy miles in diameter. It was accompanied by a rumbling sound like distant thunder or the approach of a heavy freight train.

Edinburg, Scotland: a slight shock of earthquake was felt on the night of the 13-14th, in the county of Dunbarton. No damage was done.

San Francisco, California: slight earthquake shocks were felt in this city on the 25th, 26th, and 27th. On the 27th the movement continued ten seconds, and appeared to be from north to south; it was followed five minutes later by a very slight shock of three seconds' duration. These shocks were felt along the coast from Santa Cruz to Napa, but resulted in no damage at any point.

FOREST AND PRAIRIE FIRES.

Embarrass, Waupaca county, Wisconsin: from the 23d to the 29th forest fires prevailed in this vicinity, burning two hundred acres of timber.

The following is from the "New York Herald" of May 25, 1886:

EAST SAGINAW, MICHIGAN., *May* 24, 1886.—A forest fire of immense proportions was raging on Saturday all through the woods back of and adjoining Chippewa Station, in Clare county. It appeared at noon about half a mile southwest of Church's Camps, a mile and a half east of Chippewa Station.

On the 30th, forest fires were burning in the timber land in Michigan, along the Escanaba river, involving a loss of thousands of dollars. Forest fires were also burning at Junction City, south of the town of Phillips, and in the vicinity of Sturgeon Bay. The woods were very dry.

Forest fires were also reported from the following places:

Report of tornadoes for the month of May, 1886, by Lieut. J. P. Finley, Signal Corps, U. S. Army.

Place.	Date.	Time.	Direction.	Form of cloud.	Number of persons killed.	Number of persons wounded.	Width of path.	Number and kind of animals killed.	Number and kind of buildings destroyed.	Total valuation of property destroyed.	Authority.
							Yards.				
Shaw, Brooklyn, Emporia, and Osage Mission, Kansas.	6	3 p. m	ne.	Funnel					Few dwellings, 1 blacksmith shop, 1 barn.		H. E. Klay, "Springfield Herald," "Globe Democrat," Missouri, and "Rep. Plain Dealer," Kansas.
Oxford Mills and Animosa, Iowa.	8	10 p. m	ne.					80 sheep	Many buildings	$30,000	"Burlington Gazette," "Eureka of Animosa," Animosa "Journal," Iowa, and Wm. H. Thurston, Oxford Mills, Iowa.
Nortonville, Kansas	9	9 a. m	ne.				200				W. P. Badger, Muscotah, Kansas.
Oskaloosa and Albia, Iowa	9	1 p. m	ne.						Number of buildings.	Several thousand dollars.	"Oskaloosa Herald," "Oskaloosa Times," and "Albia Union," Iowa.
Pittsburg, Blairsville, Cokeville, Garfield, Bolivar, Sardis, Stahlstown, Fallston, and New Derry, Pennsylvania.	10	5.40 p. m	e.	Funnel		2	200	1 cow	Several	Several thousand dollars.	Seven residents and numerous papers of the state. *
Nortonville, Kansas	11	Not given.				Many			Many	$30,000	J. I. Claiborne, "New York Times," and "Bloomington Daily Pantagraph," Illinois.
Armstrong, Henning, Potomac, Weston, Odell, Padua, Danville, Pontiac, and Mount Carroll, Illinois.	12	About 5 p. m.	ne.	Funnel	1	1	Varying from 150 to 800.		Many	50,000	Charles Carpenter, Henning, Illinois, Geo. Habel, Potomac, Illinois, C. E. Littell, Armstrong, Illinois, S. A. McCarling and numerous newspapers of the state of Illinois, †
Attica, Frankton, Hamilton, Williamsport, Peru, Bridgeport, Wilkinson, Sheridan, and Ridgeville, Indiana.	12	6 p. m	ne.	Funnel	5	Many	Varying from 75 to 250.	Some hogs and cows.	Many	About $300,000	A. S. Peacock, Levi James, D. O. French, Sarah J. Hadley, and J. A. Hatton and a number of papers, all of Illinois.
Clifton, Millfield, Readville, Lebanon, Oregonia, and Union Village, Ohio.	12	10 p. m	ne.	Funnel	Many	Many	From 100 to 800.	Many of different kinds of animals.	6 dwellings, 2 barns, 1 schoolhouse, 1 store building, and numerous outhouses.	Indefinite	Y. W. Confan, A. J. Leonard, C. Kibble, and J. R. Turner, and numerous papers from Ohio.
Frankfort and Fairfield, Kentucky.	13	3 30 p. m	ne.	Funnel							K. Shernly and newspapers from Kentucky.
Jacksonville and Mount Sterling, Illinois.	13	5.30 p. m	ne.	Funnel		1			2 dwellings and several outhouses.	$15,000	G. W. McMillen, "Daily Jacksonville Journal," and "Bloomington Daily Pantagraph," Illinois.
Meriden, Kansas	14	10 a. m	ne.			20			20 buildings		"Missouri Republican," Missouri.
Exira, Iowa	14	Not given.	ne.	Funnel			44		1 school-house and a number of dwellings.		"Audubon County Journal."
Near Lansing, Michigan	14	4 p. m	ne.	Funnel			400	1 horse	A few houses and barns.	Great	"State Republican," of Lansing, Michigan, and "Globe Democrat," of Saint Louis, Missouri. ‡
Carrothers, McCutchenville, Coldwater, Adrian, Victoria, Forest, Republic, Tiffan, Kemton, and Dunkirk, Ohio.	14	9 p. m	ne.	Funnel	43	Many	200 to 400	Horses, cattle, sheep, and hogs.	9 dwellings, 3 barns, 1 schoolhouse, and 2 churches.	$1,000,000	Mrs. John Rice, W. R. H. Sulliger, Russell J. Thompson, P. A. Buchnan, and H. Melbor, and numerous newspapers from the state of Ohio. §
Thornton, Nebraska	22	Not given.	ne.					1 cow	Barn and kitchen		J. B. Lewis.
Springport, Michigan	25	6.30 p. m	Easterly	Funnel							E. W. Angell.
Russell, Kansas	25, 26	Midnight.	Easterly	Funnel							F. E. Jerome.
Columbiaville, Michigan	26	Not given.							Several		Newspaper clipping.
Dryden, Lapeer, and Rodgersville, Michigan.	27	Near midnight.	Easterly				1 mile		Several dwellings and 2 barns.	Considerable	J. G. Kinsman, Wm. Quarterman, and "Evening Star," Washington, D. C.

* Storm travelled ne. to Coketown bridge, then e. to Bolivar, following the river.

† Two jet black clouds from sw. and nw. met to form at first two funnels, travelling high in air, but afterward one large funnel, blue black, and coming nearer earth; became stationary a moment and moved on again after flash of lightning came dispersing clouds. Another observer states as follows: "A cloud met, apparently three feet in diameter; fell to within fifty feet of earth, when it apparently burst into fragments, and a large cloud, apparently as large as a box of a wagon, bagged down in centre to point six inches across thirty seconds after bursting cloud. The black cloud moved rapidly, rising and falling, until the point touched the earth, when it immediately developed into a cloud column fifty feet in diameter, reaching from earth to clouds."

‡ Funnel-shaped; at first very small, like a whirlwind, and hugged the ground closely, increasing in area as it advanced. Another observer states as follows: "After forming stood still a moment, and then moved off as fast as a man could walk, increasing in size and velocity as it progressed."

§ Dark, funnel-shaped cloud, accompanied by a sharp, whistling sound; upper part black, lower part fiery. A sulphury odor followed passage. Another observer states as follows: "Balloon-shaped, with long tail, like elephant's trunk, with a revolving, whirling motion; upper part black, lower part semitransparent, and stem luminous and swinging to and fro."

Michigan.—Marquette, 31st; Escanaba, 22d, 24th.
New Jersey.—Clayton, 2d, 3d.
New York.—Factoryville, 2d.
Dakota.—Yankton, 2d, 3d, 6th, 7th, 10th, 11th.
Minnesota.—Saint Vincent, 1st, 4th, 25th to 29th.
Nebraska.—North Platte, 3d, 4th, 5th, 7th to 12th, 15th, 17th, 18th, 21st, 23d; Valentine, 18th.
Texas.—El Paso, 22d; Midland, 10th; Fort Stockton, 31st.

INSECTS.

Memphis, Tennessee, 13th: buffalo gnats have made their appearance in great numbers, and have killed a number of cattle.

Decatur, Adams county, Indiana, 14th: during the preceding week grasshoppers in vast numbers have appeared in this county.

Nashville, Tennessee: during the spring cut-worms have been very destructive to corn, oats, and grass.

Milan county, Texas: during the last days of the month millions of grasshoppers appeared in this section of the state. Reports from the adjoining counties of Williamson, Bell, and Falls state that grasshoppers had appeared in those counties also.

Ashwood, Maury county, Tennessee, 31st: the Colorado beetle is very numerous and destructive in this county.

METEORS.

The bark "Vidette," Captain Sawyer, from Cienfuegos, reports: "May 5, at 1.30 a. m., weather fair with a sky nearly clear, and wind from the south, was set on fire in the maintop by a meteor. By prompt action the mates and two men put out the fire in five or six minutes. The meteor seemed like a fire rocket, lighting up the vessel throughout, and in less than ten seconds the mast was in full blaze at the masthead."

Wauseon, Fulton county, Ohio: on the 20th a meteor was observed at 6 p. m., in the southeastern sky; it appeared to be about four or five inches in diameter and was as bright as an electric light. The meteor moved from near the zenith to the southeast, and when at an altitude of about 35°, it exploded like a rocket. It was seen in the clear sky in the afternoon about one hour before sundown.

Meteors were also reported in the various states and territories as follows:

Florida.—Limona, 12th; Key West, 10th, 15th.
Illinois.—Windsor, 7th.
New Jersey.—Dover, 31st.
New York.—Mountainville, 1st to 6th; Rochester, 8th.
Nevada.—Fort McDermitt, 7th.
North Carolina.—Smithville, 4th.
Pennsylvania.—Dyberry, 28th; Erie and Pittsburg, 21st.
Texas.—Cleburne, 31st.
Wyoming.—Fort Bridger, 15th.
Washington Territory.—Tatoosh Island, 3d.

MIGRATION OF BIRDS.

Geese flying northward.—Saint Vincent, Minnesota, 3d.
Ducks flying northward.—Saint Vincent, Minnesota, 6th.

POLAR BANDS.

California.—San Francisco, 6th; Los Angeles, 25th; San Diego, 22d.
Colorado.—Montrose, 2d,
Florida.—Archer, 16th, 21st, 28th, 29th.
Illinois.—Riley, 3d, 14th, 18th.
Kansas.—Ninnescah, 1st, 18th; Salina, 13th; Yates Centre, 29th.
New Jersey.—Beverly, 22d.
Ohio.—Napoleon, 6th.
Tennessee.—Nashville, 18th, 19th.
Texas.—El Paso, 10th, 13th, 15th.
Wyoming.—Fort Bridger, 7th.
Wisconsin.—Prairie du Chien, 4th, 16th, 17th, 20th.

SAND STORMS.

El Paso, Texas, 9th, 11th, 23d, 28th, 30th.
Yuma, Arizona, 3d, 8th, 9th, 25th.
Fort Assinaboine, Montana, 19th.

WATER-SPOUT.

The Signal Service observer at Keokuk, Iowa, reports that during a heavy gale and thunder-storm at 3.15 p. m. of the 9th a water-spout formed as the storm crossed the Mississippi River; it was from forty to sixty feet high and crossed the river in a southeasterly direction, twisting off tree-tops when it reached the Illinois shore, and disappearing on the hill sides.

Meteorological record of voluntary observers and Army post surgeons, May, 1886.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature. Maximum.	Minimum.	Mean.	Rainfall.	Stations.	Temperature. Maximum.	Minimum.	Mean.	Rainfall.
Alabama.	°	°	°	*Inches*	*Indian Territory.*	°	°	°	*Inches*
Birmingham *	88	44	69.9	3.22	Reno, Fort	101	50	73.9	0.31
Greensborough	88	54	70.9	2.86	Supply, Fort	98	45	72.1	0.06
Mount Vernon B'ks.	94	53	74.1	2.53	*Indiana.*				
Prattville	92	43			Fort Wayne*	85	40	64.0	2.96
Arizona.					Jeffersonville	88	44	66.4	3.71
Lowell, Fort	109	41	80.2	0.00	Knightstown	86	38	62.2	1.86
McDowell, Fort	114	42	81.5	0.00	Laconia	84	47	68.0	4.49
Tucson				0.00	Lafayette	88	34	62.3	7.08
Verde, Fort	102	37	72.9	0.00	LaGrange	82	34	60.0	4.50
Arkansas.					Logansport*	92	43	66.6	5.20
Lead Hill *	100	44	74.4	2.64	Mauzy	86	34	62.0	3.37
British Columbia.					Spiceland	89	37	63.8	3.60
New Westminster	78	33	57.3	2.35	Sunman*	88	38	67.0	0.09
California.					Terre Haute*	85	43		3.36
Alcatraz Island	79	47	56.6	0.25	Vevay	89	43	67.3	4.36
Angel Island	90	50	60.2	0.35	*Iowa.*				
Benicia Barracks	85	51	61.3	0.14	Bancroft	86	30	60.7	3.54
Bidwell, Fort	84	31	57.0	1.44	Cedar Rapids *a* *	90	36	62.5	2.69
Cahuenga				0.00	Cedar Rapids *b* *	88	30	60.0	
Fall Brooke	92	42	62.0	0.00	Clinton *	88	34	61.3	4.23
Hydesville				1.28	Cresco	82	40	60.1	2.03
Mason, Fort	84	53	63.8	0.20	Des Moines	90	33	62.7	
Murietta *	98	44	62.4	trace.	Independence *	82	46	62.1	5.00
Nicolaus *	88	53	64.1	0.15	Logan	96	38	65.5	1.80
Oroville *	90	52	68.4	0.30	Fort Madison	87	49		4.80
Poway *	90	54	64.6	0.00	Monticello *	89	32	61.1	4.65
Presidio of San F	82	43	57.2	0.20	Mount Vernon *	92	40	66.0	
Princeton *	92	41	63.3	0 35	Oskaloosa *a* *	94	39	66.0	5.69
Sacramento*	94	43	60.2	0.12	Oskaloosa *b* *	85	40		
Salinas	78	49	57.2	0.20	*Kansas.*				
Santa Barbara	80	44	60.5		Allison	98	37	67.7	1.96
Susanville	85	38		1.12	Atchison *	93	45	65.7	1.72
Colorado.					El Dorado	92	41	70.2	1.50
Lewis, Fort	83	29	57.1	0.72	Elk Falls				0.40
Salida	88	24	60.6	0.16	Emporia*	94	42		2.60
Connecticut.					Fort Scott	95	53	72.0	6.20
Bethel				3.23	Hays, Fort	95	27	64.2	1.80
Hartford	85	33	55.8	3.42	Independence *	98	44	71.9	1.11
North Colebrook *	78	32	52.6	2.53	Lawrence	91	44	68.5	5.72
Voluntown	84	42		3.25	Manhattan	99	52		5.25
Dakota.					Ninnescah	99	37	72.6	0.25
Abr. Lincoln, Fort	93	31	60.9	1.70	Ottowa	95	39	73.1	5.08
Pembina, Fort	86	21	54.9	1.55	Riley, Fort	94	32	71.4	3.10
Randall, Fort	97	32	64.7	2.62	Salina	81	53	70.2	3.07
Sisseton, Fort	86	28	58 4	1.64	Sterling	99	46	69.0	1.00
Totten, Fort	87	26	57.4	2.87	Topeka	96	50	69.3	3.00
Vermillion	92	39	62.0	2.23	Wakefield *	97	46	70.2	3.07
Webster	93	29	62.6	6.22	Wellington	95	41	67.6	0.88
Yates, Fort	98	32	62.4	1.92	W. Leavenworth *	92	43		10.80
District of Columbia.					Westmoreland*	94	44	68.0	5.78
Distributing Res'r*	84	48	63.1	9.75	Wyandotte	90	49	69.5	4.84
Kendall Green	82	46	62.4	9.20	Yates Centre	92	41	68.9	2.87
Receiving Res'v'r*	84	49	64.7	8.56	*Kentucky.*				
Rock Creek Bridge*	89	49	66.6		Bowling Green	92	47	67.9	3.46
Florida.					Frankfort	88	41	66.8	4.03
Archer *	90	50	72.5	1.83	Richmond	84	43	64.9	4.96
Limona *	97	54	80.0	1.09	*Louisiana.*				
Manatee *	92	64	76.1	0.17	Grand Coteau	91	56	74.5	1.30
Meade, Fort				2.20	Liberty Hill				0.25
Merritt's Island	92	60	76.3	0.88	Luling *	89	54		2.64
St. Augustine, Fort	94	55	74.0	1.83	*Maine.*				
Tallahassee *	90	60	73.0	2.15	Bar Harbor	78	34		3.90
Georgia.					Buckfield *	80	39		4.46
Athens	91	41	69.5	6.84	Cornish *	81	40	54.6	3.71
Forsyth *	90	50	72.6	4.05	Gardiner	78	33	54.0	3.76
Milledgeville	95	43	71.4	2.59	Kent's Hill	79	34	53.2	4.00
Idaho.					Orono *	78	35	53.4	4.67
Boisé Barracks	94	26	63.6	0.54	*Maryland.*				
Cœur d'Alene, Fort	87	39	57.0	1.89	Cumberland	80	42	62.0	3.62
Illinois.					Fallston*	82	42	59.3	8.26
Anna *	90	45	69.8	3.71	Great Falls*	88	47	63.4	7.77
Bloomington	86	43		2.49	McDonogh	80	41	62.2	5.78
Collinsville	90	40	64.6	3.72	McHenry, Fort	83	45	61.3	6.86
Charleston*	91	39	65.3	3.56	Woodstock	85	38	60.6	7.36
Geneseo *	85	36	63.3	3.98	*Massachusetts.*				
Mattoon *	94	46	68.0	4.98	Amherst *a*	82	29	57.3	3.10
Peoria	92	39	67.7	2.90	Amherst *b*	84	43	57.5	3.32
Riley	81	33	57.9	3.13	Blue Hill Obs'y	82	34	54.0	3.94
Rockford*	82	41	59.4	4.93	Deerfield	86	30	57.8	3.36
Sandwich	85	44	64.7	3.00	Dudley	83	25	53.0	2.77
South Evanston	86	32		3.05	Fall River	82	35	55.6	4.26
Sycamore	82	41	58.2	4.24	Milton	82	33	54.8	3.95
Windsor	91	37	64.9	5.53	New Bedford	82	34	55.3	4.49

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature. Maximum.	Minimum.	Mean	Rainfall.
Massachusetts—Con.	°	°	°	*Inches*
Princeton	79	35	53.8	3.80
Somerset*	92	36	59.3	4.19
Taunton	89	32	56.8	4.26
Westborough*	86	32	59.0	3.01
Williamstown	77	34	56.7	4.77
Michigan.				
Birmingham	87	32	.....	2.97
Brady, Fort	80	29	.....	1.92
Harrisville*	85	28	.....	1.20
Hudson	87	33	.....	4.03
Kalamazoo	81	37	.....	3.64
Lansing	82	33	57.8	3.00
Mottville*	83	34	.....	1.12
Pentwater	81	22	51.7	0.77
Thornville	84	36	58.4	3.45
Traverse City*	85	31	.....	2.49
Minnesota.				
Minneapolis	83	42	59.8	0.99
Preston*	86	41	.....	.....
Snelling, Fort	85	31	60.7	1.06
Missouri.				
Carthage	96	45	73.6	1.12
Central College*	93	43	68.0	3.12
Centreville	101	33	.....	2.89
Conception*	87	43	68.7	4.73
Pierce City	93	43	70.2	2.20
Springfield*	87	40	68.4	9.30
Warrenton*	88	48	66.7	.....
Montana.				
Assinaboine, Fort	91	11	60.3	0.54
Ellis, Fort	94	22	55.3	1.45
Keogh, Fort	101	24	64.6	5.82
Missoula, Fort	85	33	56.5	0.51
Shaw, Fort	92	23	58.0	0.63
Nebraska.				
Brownville	.....	.....	66.1	.....
Crete	91	39	65.3	3.39
De Soto*	95	36	65.1	2.16
Fairbury	94	.....	.....	4.66
Fremont*	93	41	64.6	3.41
Genoa	92	40	64.2	4.85
Hay Springs*	93	25	59.3	1.80
Marquette	90	.....	.....	6.27
Niobrara, Fort	101	34	64.9	1.14
Sidney, Fort	95	30	61.9	1.52
Stockham	96	.....	.....	4.30
Nevada.				
Carson City	88	28	59.6	0.26
Halleck, Fort	87	20	57.2	0.29
McDermit, Fort	87	30	57.3	0.19
New Hampshire.				
Antrim	.....	.....	.....	3.60
Ashland	.....	.....	.....	3.76
Belmont	.....	.....	.....	2.81
Berlin Mills	79	37	.....	1.65
Bristol	.....	.....	.....	3.52
Lake Village	.....	.....	.....	2.94
Nashua	85	29	56.1	2.70
Wier's Bridge	.....	.....	.....	2.72
Wolfborough	.....	.....	.....	3.18
Woodstock	.....	.....	.....	3.48
New Jersey.				
Beverly*	83	46	58.0	8.08
Clayton*	84	43	60.4	4.44
Dover*	84	36	57.3	6.07
Egg Harbor City	85	40	59.8	15.07
Moorestown	84	46	58.5	6.80
Paterson*	87	39	60.0	5.94
Phillipsburg	.....	.....	.....	6.24
Princeton	82	41	59.3	5.58
Readington*	84	48	62.1	.....
Roseland	.....	.....	.....	6.01
Upper Montclair	81	40	58.2	6.20
Vineland	84	42	62.4	4.85
New Mexico.				
Bayard, Fort	94	40	69.9	.....
Gallinas Spring	91	45	.....	0.31
Puerto de Luna	96	52	68.7	.....
Selden, Fort	104	48	77.1	0.00
Union, Fort	89	23	62.7	0 13
New York.				
Auburn	77	35	55.7	2.92
Columbus, Fort	80	45	58.4	5.08
Cooperstown*	75	40	54.0	2.50
David's Island	84	42	59.0	4.15
Factoryville*	82	34	56.2	1.42
Humphrey*	80	34	53.7	3.35
Ithaca	79	36	56.8	1.79
LeRoy	76	36	54.9	3.62
Madison Barracks	73	32	54.9	2.16
Menand Station	80	47	59.4	3.53
Mountainville	84	33	57.6	4.21
Niagara, Fort	76	35	53.7	1.14
North Volney*	79	42	54.1	.....
Palermo*	80	38	52.6	1.07
Palmyra*	81	44	.....	.....
Penn Yan	.....	.....	.....	1.67
Plattsburg B'ks	73	40	55.2	1.48
Setauket	80	43	57.0	3.13
Syracuse	80	42	.....	.....
West Point	85	39	59.6	4.16
White Plains	82	49	59.8	4.52
North Carolina.				
Chapel Hill	93	46	67.8	4.00
Flat Rock	87	40	62.1	9.47
Lenoir	85	42	.....	6.20
Lincolnton	80	45	65.0	11.96
Raleigh	93	47	68.0	1.70
Reidsville*	90	34	63.0	6.57
Statesville*	91	49	66.6	8.91
Wake Forest*	91	45	68.0	3.87
Weldon*	88	48	63.9	2.11
Ohio.				
Cleveland	80	36	58.1	1.97
Elyria	83	41	.....	1.63
College Hill*	90	43	68.1	8.25
Fostoria*	90	44	61.4	3.07
Garrettsville	85	28	55.9	2.22
Hiram	82	32	68.5	2.58
Jacksonborough*	90	38	63.3	6.40
Napoleon	85	37	62.4	3.78
North Lewisburg	86	40	65.0	7.55
Ruggles*	80	40	57.6	3.15
Tiffin*	88	40	60.4	2.96
Wauseon	89	32	60.4	2.69
Westerville	84	38	61.4	4.75
Yellow Springs	86	40	63.1	6.27
West Milton	92	39	60.0	6.00
Oregon.				
Albany*	84	40	58.8	1.79
Bandon*	63	32	.....	1.00
East Portland*	88	36	.....	1.08
Eola*	79	42	56.0	1.56
Klamath, Fort	83	11	51.5	0.90
Pendleton*	92	41	.....	1.05
Pennsylvania.				
Bethlehem*	86	47	61.3	5.59
Blooming Grove*	84	40	57.5	5.10
Catawissa*	84	42	63.2	7.19
Drifton	85	36	56.0	8.00
Dyberry	81	33	54.4	4.41
Easton	.....	.....	.....	7.14
Franklin*	80	32	52.8	1.03
Germantown*	78	44	.....	5.36
Grampian Hills*	84	40	61.5	3.87
Philipsburg*	79	35	56.6	.....
Quakertown*	77	40	56.0	6.66
Wellsborough*	84	40	62.8	1.51
West Chester	82	39	59.1	7.00
Wysox	81	38	59.8	2.57
Zionsville	84	42	.....	5.01
South Carolina.				
Kirkwood*	88	52	69.9	5.66
Pacolet	.....	.....	.....	13.23
Spartanburg	90	45	67.8	13.60
Stateburg*	94	49	71.5	3.13
Tennessee.				
Ashwood	86	44	65.0	3.48
Austin	91	44	70.0	2.54
Milan	90	42	69.0	3.41
Paris*	90	54	72.0	.....
Texas.				
Austin*	98	60	80.0	trace.
Cleburne	94	52	64.0	0.00
Comfort	.....	.....	.....	1.46
Concho, Fort	107	50	81.1	1.52
Corsicana	.....	.....	.....	0.00
McIntosh, Fort	103	56	83.6	0.95
Midland	101	52	77.5	0.10
Ringgold, Fort	107	66	85.2	0.94
New Ulm	97	54	70.1	0.05
Silver Falls	100	44	.....	0.01
Vermont.				
Brattleborough	85	32	59.3	3.71
Burlington	77	40	58.0	2.61
Charlotte*	77	44	55.5	3.50
Lunenburg	76	39	52.3	2.37
Newport*	73	40	55.4	4.57
Poultney	83	34	55.5	2.87
Post Mills Village*	77	38	54.2	.....
Stowe	.....	32	.....	.....
Strafford*	78	40	55.7	2.90
Virginia.				
Accotink	84	47	63.1	8.72
Bird's Nest*	87	51	66.8	7.70
Dale Enterprise*	88	43	67.3	12.66
Monroe, Fort	85	45	65.2	4.23
Summit	86	38	61.7	.....
Snowville*	84	39	.....	4.30
University of Va	85	41	62.7	9.66
Variety Mills	86	39	63.3	8.22
Wytheville	84	36	62.7	5.19
Washington Territory.				
Bainbridge Island*	82	40	56.7	1.76
Tacoma*	74	39	57.3	1.84
Townsend, Fort	74	35	55.5	0.76
Walla Walla, Fort	90	31	64.2	0.48
West Virginia.				
Clarksburg	84	35	65.7	4.54
Helvetia*	84	32	58.4	7.08
Parkersburg	86	39	62.7	5.29
Wisconsin.				
Embarras*	88	36	60.5	2.05
Evansville	87	31	54.0	.....
Franklin	.....	.....	.....	1.68
Wisconsin—Cont'd.				
Fond du Lac*	89	28	55.8	1.09
Madison	83	37	59.3	2.02
Manitowoc	86	31	55.6	1.39
Neillsville*	86	18	49.6	1.70
Prairie-du-Chien	85	41	62.3	2.86
Wyoming.				
Bridger, Fort	81	15	55.3	2.00
Fred Steele, Fort	94	17	58.7	trace.
Washakie, Fort	88	19	59.2	1.00
Laramie, Fort	94	34	63.6	0.14

NOTES AND EXTRACTS.

The following is an extract from the May, 1886, report of the "Alabama Weather Service," under direction of Prof. P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn:

The mean temperature of the state was 3°.2 below the normal.

Rains and thunder showers were frequent throughout the month, in some instances accompanied with brisk winds. There has been much complaint among farmers in some sections of the state on account of the rapid growth of grass in their crops, caused by the general fall of rain from the 15th to the end of the month. The average rainfall for the whole month was, however, 1.40 inches below the normal.

Some stations report that the fruit is falling from the trees, due to the cool weather in April and also to the attacks of insects.

Summary.

Mean temperature, 71°.4; highest temperature, 95°, at Selma, on the 28th; lowest temperature, 38°, at Gadsden, on the 2d; range of temperature, 57°; greatest monthly range of temperature, 52°, at Gadsden; least monthly range of temperature, 34°, at Greensborough; mean daily range, 17°; greatest daily range of temperature, 37°, at Gadsden, on the 3d; least daily range of temperature, 0°, at Union Springs, on the 26th.

Mean depth of rainfall, 3.50 inches; mean daily rainfall, 0.113; greatest depth of monthly rainfall, 7.97 inches at Roanoke; least depth of monthly rainfall, 1.01 inches, at Union Springs; greatest daily rainfall, average for state 1.12 inches, on the 18th; greatest daily local rainfall, 4.05 inches at Roanoke, on the 18th.

Average number of days on which rain fell, 6; average number of cloudy days, 5; average number of fair days, 11; average number of clear days, 15.

Warmest days, 13th, 14th, 28th, and 29th; coldest days, 1st and 2d.

Prevailing direction of wind, southwest.

Chattanooga reports that the greatest velocity of wind was 28 miles per hour from the northwest, Mobile 28 miles from the southeast, and Montgomery 28 miles from the west.

The following meteorological summary for May, 1886, has been forwarded by Hon. J. T. Henderson, of Atlanta, Commissioner of Agriculture for Georgia:

Districts.	Temperature. Highest.	Lowest.	Mean.	Precipitation.
	°	°	°	*Inches.*
Northern Georgia	93.0	36.0	67.7	7.85
Middle Georgia	95.0	40.0	69.5	4.84
Southwestern Georgia	95.0	41.0	74.5	4.06
Eastern Georgia	92.0	47.0	71.6	4.35
Southeastern Georgia	99.0	56.0	75.1	3.15
State	99.0	36.0	71.7	4.85

The heavy rains in many localities have caused serious damage to corn and cotton, necessitating, in many instances, entire replanting of crops on bottom lands.

The crops are from ten to twenty days behind the usual stage of growth at this date.

The following meteorological summary and accompanying remarks are from the May, 1886, report of the "Indiana Weather Service," under direction of Prof. W. H. Ragan, of De Pauw University, Greencastle:

Districts.	Temperature. Highest.	Lowest.	Monthly means.	Average precipitation.	Spring of 1866. Mean temperature.	Average precipitation.
	°	°	°	*Inches.*	°	*Inches.*
Northern counties	88.0	34.0	64.0	4.98	51.7	9.62
Central counties	89.0	34.0	63.2	4.28	51.8	9.75
Southern counties	92.0	38.0	66.9	4.06	55.2	9.62
State	92.0	34.0	64.7	4.44	52.9	9.66

Weather.—At eight stations, averaged, 9 days were clear, 15 fair, 7 cloudy, and 0.01 or more rain fell on 10. Severe local storms and tornadoes occurred generally on the 10th, 11th, 12th, 13th, 14th and 23d. The severest occurred on the 12th, when several lives and hundreds of thousands of dollars worth of property were destroyed, principally in Attica, Tipton, Wilkinson, Lafayette, and Evansville. A hail-storm of extraordinary severity visited portions of Hendricks county on the 23d, doing much damage.

Temperature.—The temperature for the month and spring was above normal 2°.9 and — at Logansport; 2°.4 and 2°.7 at Spiceland; 0°.3 and 0°.7 at Indianapolis; 2°.5 and 2°.9 at Connersville; 1°.6 and 0°.3 at Mauzy; 2°.1 and 3°.2 at Sunman; 2°.0 and 3°.3 at Worthington; 1°.8 and 1°.1 at Vevay; and 2°.4 and 1°.5 at Blue Lick; and for the state it was higher, 5°.0 and 4°.6 than in 1883; 3°.2 and 2°.1 than in 1884; 4°.9 and 5°.6 than in 1885; and 3°.7 and 2°.8 than the four year normals. The range for the state during May was 58°, from 92° at Huntingburgh, to 34° at La Grange and Lafayette; the greatest station range, 54° at Lafayette; least, 36° at Terre Haute and Salem; average, 44°.6; average of highest temperatures, 86°.4; of lowest, 41°.8. The mean at La Grange was 7°.7 lower than at Degonia. The mean for the centre was 0°.8 lower than for the north, and 3°.7 lower than for the south. The warmest days were the 12th, 13th, 21st, 22d, 23d, and 30th; coldest, 1st, 2d, 16th, 17th, and 26th. At La Grange the temperature was below 50° on eight days, and above 80° on two; at Indianapolis twelve and ten, respectively; at Degonia two and ten, respectively.

Precipitation (inches).—The precipitation was unevenly distributed through the month and over the state, ranging from an aggregate of 24.75 (at twenty-two stations) on the 12th, to none on the 17th, 18th, 19th, 21st, 28th; and from 7.22 at Butlerville to 1.78 at Degonia Springs. There were some remarkable variations in the fall at adjacent stations. The days of greatest fall were the 10th (aggregate 10.46), 11th (12.37), 12th (24.75), 13th (11.21), 15th (10.46). Delphi reports 2.27 in sixty-five minutes on the 12th, in two showers. For the month and spring the fall was 0.77, and — above normal at Logansport; 0.27 and 2.36 below at Spiceland; 0.58 and 1.95 below at Indianapolis; 0.54 above and 2.25 below at Vevay; and for the state the average was 0.02 and 1.19 lower than in 1883; 0.08 higher and 0.12 lower than in 1884; 0.66 and 0.81 higher than in 1885; and 0.18 higher and 0.08 lower than the four year normals. Thunder-storms occurred in all sections on the 9th, 10th, 12th, 13th, 14th, 15th, 23d; centre and south on the 1st, 11th, 30th; centre 4th, south 6th. Hail is reported on the 1st, 6th, 10th, 11th, 12th, 13th, 23d; solar halos, 3d, 4th, 8th, 16th, 17th, 25th, 26th, 30th; lunar, 10th, 13th, 16th, 17th; frosts, 1st, 2d, 4th, 16th, 17th, 26th; auroras, 8th, 25th; rainbows, 15th, 23d.

The following summary and remarks are from the May, 1886, report of the "Indiana Weather Service," under direction of Prof. H. A. Huston, of Purdue University, Lafayette:

Districts.	Temperature.			Average precipitation.
	Highest.	Lowest.	Monthly means.	
	°	°	°	*Inches.*
Northern counties	92.0	34.0	62.5	5.44
Central counties	89.0	34.0	63.6	4.07
Southern counties	92.0	41.0	66.4	3.89
State	92.0	34.0	64.3	4.47

The mean temperature of the state for May, 1886, was 2°.5 above the mean of May for the past four years; 0°.2 above the mean of fifteen years at Indianapolis; 0°.4 above the mean of thirty years at Logansport; 1°.2 below the mean of twenty-one years at Vevay; 2°.6 above the mean of thirty-two years at Spiceland; 3°.8 above the mean of six years at Mauzy; 0.3 below the mean of nine years at Blue Lick; 1°.5 below the mean of four years at Worthington; 2°.9 above the mean of four years at Connersville; 1°.5 above the mean of seven years at Lafayette, and varied less than 0°.5 from the normal. The mean temperature at the various stations varied from 1° to 3° above the average.

The mean rainfall for the state was 0.21 inches above the mean of the past four years; 0.17 above the mean of fifteen years at Indianapolis; 0.64 above the mean of thirty years at Logansport; 0.60 above the mean of twenty-one years at Vevay; 0.88 above the mean of twenty-seven years at Spiceland; 0.14 below the mean of six years at Mauzy; 0.27 above the mean of twenty-seven years at Blue Lick; 0.14 below the mean of four years at Worthington; 0.16 above the mean of four years at Connersville, and 0.90 below the mean of seven years at Lafayette. The rainfall was very unequally distributed over the state and throughout the month. The heavy rainfall from the 9th to the 15th caused many rivers and streams to overflow their banks, and did considerable damage to crops and bridges. The heavy hail and wind storm of the 23d did considerable damage to wheat in western-central counties.

Frosts are reported quite generally on the 16th, 17th, and 26th; no damage.

Solar halos are reported on the 4th, 7th, 8th, 17th, 24th, 25th, and 30th; lunar halos, on the 9th, 14th, 16th, 17th, and 18th; aurora, on the 8th and 25th.

Thunder-storms have been unusually frequent and severe. The heaviest occurred from the 9th to the 15th, and in many places were accompanied by hail and very heavy rainfall.

At about six o'clock on the evening of the 12th, a tornado formed north of Williamsport, and about two miles southwest of Attica and moved northeast across the Wabash bottom land and river, raising the water of the river to an estimated height of two hundred feet, destroying the heavy wooden carriage bridge, and demolishing all buildings in its path. The motion about the tornado centre was against the hands of a watch, and observers agree that the centre advanced about thirty-five miles per hour. Several walls of brick falling outward gave evidence of a greatly reduced pressure on the outside. The path of the tornado on entering the city was about four hundred feet wide, and on leaving, about seventy-five feet wide. The distance travelled in the city was about one-half mile. The losses were estimated at $200,000. A tornado cloud was seen near Thorntown on the same evening, but no damage reported.

The following is an extract from the "Kansas Weather Observer," published by John H. Wolfe, of Wellington:

Reports for May were received from eleven observers.

Mean temperature for the month over the area of the state as a whole was 69°.1, which is a general average of 3°.5 above the normal. The warmest periods during the month occurred between the 9th and 14th, 20th and 23d, 26th and 31st, reaching the highest temperatures on the 22d, 26th, and 29th. The coldest days were the 1st and 15th.

The precipitation was the heaviest over the area located east of a line drawn from where the Republican River crosses the northern boundary of the state to Baxter Springs. The month's rainfall over this area was from four to six inches. Over the area west of this line the rainfall averaged less than one inch.

The following is an extract from the May, 1886, report of the "Minnesota Weather Service," under direction of Prof. Wm. W. Payne, Carleton College, Northfield:

The average temperature of Minnesota for May, as reduced from reports received from the stations of the Minnesota Weather Service is 58°.9. This is 11°.4 warmer than the preceding month of April. The warmest station was La Crosse, where the average for the month was 62°.6. The highest temperature reported was at Spring Valley, 88°.0, on the 24th. The lowest was Saint Vincent, where the temperature fell 10° below the freezing point on the morning of the 15th. At the following stations the minimum temperature was below 30°, viz.: Grand Forks, 25°.0; Moorhead, 26°.7; Wadena, 24°, all on the 15th, and Park Rapids, 23°.4 on 16th. Maximum temperatures at all stations were above 80°.0, and occurred during the last decade of the month. Cool weather, with occasional light showers, was the principal feature of the weather in all districts during the first half of the month, culminating in a sharp and general frost in all parts of the state on the 15th and 16th, which cut down all early vegetables and did much injury to fruit trees which were in bloom. Strawberries in the southeastern part of the state were in many cases seriously injured. After the 16th the weather became much warmer and continued so until the end of the month. An interesting and unusual fact was that the highest temperatures at all stations from the 16th to 31st were at 70°.0 or above.

The precipitation has been noticeably below the normal amount for May at all stations in the state. The largest amount was at Wadena, where 3.85 inches were measured, but three other stations recorded more than 2 inches, viz., Spring Valley, 2.38; Moorhead, 2.51, and Park Rapids, 2.09 inches. Five stations reported less than one inch, La Crosse, 0.89; Saint Paul, 0.82; Bird Island, 0.31; Morris, 0.66, and Grand Forks only 0.20 inch. The greater amount of the precipitation for the month occurred in the form of light showers from the 1st to 15th, after which there was almost absolutely no rain at any place in the state until the 30th and 31st, when heavy showers fell along the line of the Northern Pacific Railway from Wadena to Moorhead. Snow, in amounts too small to measure, was noted at Spring Valley and Saint Vincent. The high temperatures and absence of rain during the last half of the month has been decidedly unfavorable to the growing crops which have made rather slow growth, and in many sections were suffering decided injury from lack of moisture, with prospects that late sown grain would be a partial failure unless general and heavy rains come at an early date.

The following is an extract from the May, 1886, report of the "Missouri Weather Service," under direction of Prof. Francis E. Nipher, Washington University, Saint Louis:

The mean temperature for May, 1886, has been 3°.1 above the normal temperature. The minimum and maximum reached during the month was 48° on the 2d and 88° on the 23d, neither being an uncommon temperature for May.

The month has been remarkable for its great rainfall, it being 3.21 inches in excess of the normal, 4.72. Nearly one-half, 3.53 inches, fell during two hours on the night of the 14th during a violent storm, which lasted about thirty minutes. Another heavy rainfall of 2.12 inches, accompanied by heavy thunder and lightning, occurred on the 7th. The total fall during each decade was, respectively, 2.87, 3.61, and 1.45 inches, the latter falling all in one day, viz., on the 23d.

In the state the highest mean temperature was 74°.3 at Protem, 72° at Greenfield, 69°.1 at Sedalia, and 68.1 at Oregon and Chamois. The lowest mean reported was 62°.6 at Ironton and 63°.9 at Mound City. The highest temperatures reported are, 100 at Protem, Taney county, 98° at Greenfield, and 92° at Laflin and Mexico; lowest temperatures, 34° at Ironton, 39° at Springfield; the highest minimum reported was 50° at Pleasant Hill.

The following is an extract from the May, 1886, report of

the "Nebraska Weather Service," under direction of Prof. Goodwin D. Swezey, of Doane College, Crete, Nebraska:

The opening of the season of 1886 has been peculiar. The prophecy of "a late season, because Easter came late," seemed likely to be verified, but the month of May, following upon an March and April of unprecedented snowfall, has been the warmest May since 1881, and has seemed like the coming of summer upon the heels of winter without an intervening spring.

The latest frost of the season came with an area of high barometer that overspread the country, passing eastward on the 15th and 16th. The frost was light, doing no particular damage. It was reported from the western part of the state (Hay Springs, Stockham, and Beaver Creek,) on the morning of the 15th, and from the eastern (Fairbury, Weeping Water, and DeSoto,) on the 16th, on which date frost also occurred in Wisconsin and Michigan.

The month has been, on the average, five degrees warmer than the normal temperature for May. Rainfall has been about normal.

CONVENTION.

At the convention of this service held in Lincoln two years ago it was decided to hold a meeting annually; various obstacles prevented the holding of such a convention last year. It is proposed that such a meeting be held this season and there seems to be no time so favorable as in connection with the coming State Service Assembly at Crete, on Tuesday afternoon and Wednesday forenoon, July 6th and 7th. Railroads give reduced rates to the assembly. Many will wish to attend some of the meetings on the assembly grounds, especially, perhaps, on Monday.

Accordingly all observers of this service, and all others interested in the meteorology of this state are invited to meet at Boswell Observatory at 3 o'clock, July 6th. The objects of the convention will be—

1. Better acquaintance and fellowship.
2. Mutual information as to the use of instruments and best methods of observing.
3. Discussion of projects for the better advancement of our work.

Persons expecting to attend are asked to send word before, and to the director.

The following is an extract from the May, 1886, "Bulletin of the New England Meteorological Society," under direction of Prof. Winslow Upton, Providence, Rhode Island:

Reports for the month were received from one hundred and forty-seven observers.

General conditions.—The month was an average May in nearly every respect. Both temperature and rainfall were nearly normal, and there were no violent winds nor severe frosts. A goodly number of thunder-storms were reported. The only unusual feature noted was the low barometric pressure, the monthly average falling below the usual value by nearly one-tenth of an inch. This was due chiefly to the continued low pressure which prevailed during the closing decade of the month. The general history of the month can best be traced by following the course of the barometric pressure.

Pressure.—The month began with a low pressure; from the 1st to the 3d it rose slowly to its normal value, with fair, cool weather. The minimum temperature of the month, with light frosts, were usually reported during this interval. On the 5th and 6th a depression (29.7 inches) moved from the lakes down the Saint Lawrence Valley, attended by general rain. The pressure rose on the 7th, with cooler, fair weather, but again fell as a second depression (29.5 inches) moved up the Atlantic ocean on the 8th, causing heavy general rains. The greatest wind velocities were usually reported on the 8th or 9th. From the 10th to the 15th continued cloudy weather, with occasional showers and generally easterly winds, prevailed, the pressure being below the normal, and a depression remaining during the whole period in the western states, with slight changes in position. On the 15th this depression increased in depth (29.5 inches) and moved down the Saint Lawrence Valley as a well-defined cyclone (this term being the general frame for storms characterized by a barometric depression with inblowing winds and improperly applied to those violent local disturbances known as tornadoes). Light general rains again occurred. The barometer rose on the 18th to 30.3 inches, attended by cool, fair weather. Light frosts were again numerously reported, but did scarcely any damage except at a few northern towns. On the 20th and 22d, two more cyclones passed north of the district, attended by light rains. For the rest of the month the pressure remained below its normal value. A depression (29.6 inches) existed south of New England on the 25th, possibly passing northerly across the district on that date, and moving thereafter northeasterly. On the 28th the pressure was lowest in Maine (29.7 inches). On the 29th another well-defined cyclonic depression moved down the Saint Lawrence Valley, and on the 30th, the eighth depression of the month moved easterly in the middle Atlantic states south of this district. Partly cloudy weather with frequent showers occurred in this interval, which was ended by a rise of pressure to 30.0 inches on the 31st.

The rainfall attending the general pressure movements above noted, was marked by the usual characteristics of the summer season—frequent showers rather than heavy rains, with considerable thunder and lightning. The relation of the thunder-storms to the pressure movements is one of the most interesting features of the month, and can be readily seen by comparing the above dates with those in the following paragraph:

Thunder-storms.—These were numerously reported on the 5th, 20th, 22d, 30th, and 31st. On the 5th several storms were developed; of these, one prevailed principally in northeastern Massachusetts, at about 3 o'clock, and a second in Connecticut, Rhode Island, and southeastern Massachusetts, at about 5 o'clock. At Essex, Massachusetts, the first of these was unusually severe, very large hail and a violent wind doing considerable damage. The storm of the 20th was reported from all parts of the district; rain began in the northwestern corner of Vermont at 8 a. m., and reached Rhode Island at 7 p. m. In southern New Hampshire and northern Massachusetts no rain fell, but rain again occurred until the storm was dissipated in northern Connecticut and Rhode Island. The rainfall was everywhere light, amounting to 0.5 inch as a maximum in the hilly region of western Massachusetts. On the 22d there were several very severe local showers, and one moved from the Connecticut River easterly in Massachusetts, from 8 to 10 p. m. This storm was most severe near Ludlow. On the 30th there was a succession of showers over the whole district at various hours in the afternoon. Damage from hail is reported from Rutland, Vermont, and from lightning at Deerfield and Groton. On the 31st, in the early morning, a thunder-storm moved easterly in Connecticut, Rhode Island, and southeastern Massachusetts. Besides the above, thunder and lightning were reported in the general storm of the 8th, and at a very few stations on the 4th, 10th, 11th, 12th, 13th, 19th, 21st, 23d, 24th, 26th, 27th, 28th.

Advance of the season.—The season continues forward and the promise of full crops remarkably good.

Auroras.—A brilliant aurora was generally observed on the 8–9th, in spite of moonlight. Other dates are: Eastport, 1st, 12th, 17th, 21st, 26th; Kent's Hill, 5th, 21st; Mount Washington, 21st; Cambridge, 1st, 11 p. m., (suspected); Newburyport, 21st, 25th, 28th (suspected), 31st (suspected); Parker's Ridge, 10th; Saint John, 17th, 8.12 p. m.

The following summary is made from reports furnished in advance of the regular monthly report, by Prof. B. F. Thomas, of the Ohio State University, Columbus, director of the "Ohio Meteorological Bureau:"

State summary.

Temperature.—Mean, 62°.7; highest, 90°.0, at Ohio State University, Columbus, on the 22d; lowest, 32°.0, at Hiram, on the 17th; greatest monthly range, 56°.3, at Wauseon; least monthly range, 41°.4, at Cincinnati; greatest daily range, 44°.5, at Newcomerstown, on the 14th; least daily range, 4°.0, at Hiram, on the 9th.

Precipitation.—Average monthly precipitation, 4.37 inches; greatest monthly rainfall, 7.55 inches, at North Lewisburg; least, 1.99, at Oberlin. Average number of days on which rain fell, 11.7; clear days, 10.0; fair days, 13.1; cloudy days, 7.9.

Prevailing direction of the wind, west.

The following is an extract from the "Tennessee State Board of Health Bulletin," for May, 1886, prepared under the direction of J. D. Plunkett, M. D., President of the State Board of Health. The weather report is prepared by Major H. C. Bate, in charge of the State Meteorological Service:

The mean temperature for May was 67°.04, 2°.51 above the mean for May, 1885, and only a fraction above that for May of the year previous. The highest temperature, 91°, recorded on the 13th, was 3° below the maximum of May, 1885, and 1° above that of May, 1884. The lowest temperature, 36°, recorded about the 1st and 3d, was, respectively, 3° above and 3° below the minimums of the corresponding periods of 1885 and 1884. The monthly range of temperature 55°, 6° less than in 1885, and 4° more than in 1884.

The mean precipitation was 4.42 inches, a fraction over the means for May of the two preceding years. Of this amount the eastern division received about five and a half inches, the middle division received about three and a half inches, and the western division received nearly four and three-quarter inches. The greatest rainfall occurred on the 6th, and was generally heavy throughout the state, the average being eight-tenths of an inch. It was heaviest in the eastern and western divisions, and continued through the 7th day. The greatest local daily rainfall, 6.80 inches, was reported on the 28th at Greenville, and was the greatest reported since the organization of the State Weather Service. Other heavy local rains were reported, at Savannah, 3.40 inches, on the 6th; at Covington, 3.00 inches, on the 7th; at Bolivar, 2.50 inches, on the 19th; and at Waynesborough, 2.00 inches, on the 20th. From the 8th to the 14th, inclusive, there was almost an entire absence of rain throughout the state, but from the 18th to the 31st, except two or three days, rain fell daily. The least monthly rainfall was reported from Nashville, being only 2.08 inches. There were nine days during the month on which no rain was reported, viz., 3d, 4th, 10th, 11th, 12th, 13th, 16th, 17th, and 26th. Many of the rains during the month were local in their character. Some of them were accompanied with severe electric storms.

There were a few frosts during the month, and were reported as follows: Nashville, Hohenwald, and Bolivar, on the 1st; Ashwood, 2d; Farmingdale, 3d and 16th; Andersonville, 15th and 16th; Waynesborough, 16th and 17th; Cookville, 17th. These were reported very light and did no damage.

State summary.

Mean temperature, 67°.04; highest temperature, 91°, on the 13th, at Chattanooga, Austin, and Nashville; lowest temperature, 36°, on the 1st, at Hohenwald, and on the 3d, at Farmingdale; range of temperature, 55°; mean monthly range of temperature, 44°.47; greatest monthly range of temperature, 54°, at Hohenwald; least monthly range of temperature, 34°, at Covington; mean daily range of temperature, 16°.97; greatest daily range of temperature, 39°,

on the 3d, at Farmingdale, and on the 31st, at Fostoria; least daily range of temperature, 2°, on the 1st, at Cookville, on the 20th, at Greeneville, and on the 24th, at Manchester; mean of maximum temperatures, 88°.13; mean of minimum temperatures, 43°.07.

Mean depth of rainfall, 4.42 inches; mean daily rainfall, 0.142 inch; greatest rainfall, 7.80 inches, at Greeneville; least rainfall, 2.08 inches, at Nashville; greatest local daily rainfall, 6.80, inches, on the 28th, at Greeneville; days of greatest rainfall, 6th, 7th, 15th, 19th, 24th; day of greatest rainfall, 6th.

Average number of days on which rain fell, 10; average number of clear days, 10.9; average number of fair days, 12.8; average number of cloudy days, 7.3; days without rainfall, 3d, 4th, 10th, 11th, 12th, 13th, 16th, 17th, 26th.

Warmest day, 13th; coldest days, 1st, 3d.

Prevailing wind, southwest.

The following additional data in reference to the flood in the Cumberland River during the first half of April, 1886, is furnished by the Signal Service observer at Nashville, Tennessee:

In this report it is proposed to show, as accurately as possible, the amount of damage which would have been caused from overflow if no warnings had been given, also the actual loss experienced with the aid only of special river stations on the upper Cumberland.

The Chief Signal Officer announced in a special bulletin dated March 26, 1886, that "severe local storms will occur in the Ohio Valley and Tennessee during the next succeeding twenty-four hours." Heavy rains occurred in East Tennessee and on the upper Cumberland during the last six days of March.

The river at Nashville rose rapidly thereafter until April 1st, at 2 p. m., when it became stationary. It was then thought that the river would fall. Heavy rains occurred again on the upper Cumberland, and from that time until April 10th, the rise varied from one-tenth to one and one-half inches per hour. Prompt and timely warning was given to the lumber, steamboat, and other interests in this city and at Clarksville, Tennessee, forty miles below Nashville.

The water reached the danger-line at 6 a. m., April 6.

Following the issue of a few special river bulletins, the entire population seemed to place entire confidence in the system of river reports, and great demand was made for them.

The losses to the business interests were comparatively light owing to the timely warnings sent out by the observer. Those families who resided on low ground sustained heavy losses. Though warned in time, many neglected to remove their household effects to higher ground.

On the west side of the river there were four separate areas under water. The first area extended from Madison street through North Front and College streets northward to the city park; thence northwestward beyond the city limits for a distance of three and a half miles, overflowing the country west of the river for one and a half miles. The second overflown area on the west side of the river embraced that territory near the centre of the city, from Lick Branch culvert southwestward along Jefferson to Warren street; thence southward beyond the Nashville, Chattanooga, and Saint Louis railroad trestle-work, describing a circle to Pearl street; from Pearl street the backwaters extended through to McLemore street, cutting off travel by street railway (the water was three and three-fourths feet deep here); from McLemore street the water found its way to Crawford street, running parallel with this street to Cherry street; then, in a northeasterly direction, back to the river. By actual count there were six hundred and forty-eight houses submerged in this district, causing much hardship and distress among the colored population. The water was twenty-two feet deep at different places within this region.

The third overflown area on the west side of the stream took in a portion of the city wharf through Market, Cherry and College streets in a southwesterly direction to Sumner street, down Sumner on the east side to Cherry street; thence through Franklin and Mausker streets eastward back to the river. There are many business houses in this district. The damage to the business interests here was trifling ($1,750). Household goods were much damaged in this area.

The fourth area overflown on the west side of the river included a line drawn from the City Water Works around to South Sycamore street eastward to Gordon street; thence southeastward over the Lebanon Turnpike, back again and northeastward for a distance of two miles beyond the city limits. In this territory there were only a few houses under water. Six brick yards and three lumber mills are located upon these lowlands. The brick companies lost their entire stock of bricks.

The overflown regions east of the river (on the Edgefield side) were in three districts. The first territory extended within the line drawn from the river parallel with the Louisville and Nashville railroad track, curving northward toward Oldham street over to Spring street; thence northwestward to Cowan avenue, and from Cowan avenue northeastward beyond the corporation. The Indiana Lumber Company's plant is situated within this overflown area. Their damage was very slight. Many houses were submerged in this region, the losses being severely felt.

Area number two, on the east side of the river was, virtually, a continuation of area number one, except that the Louisville and Nashville Railroad bed intervened. A swift current ran through First street under the railroad trestle. The water ran parallel with the railroad track until Spring street was reached, inundating the most of Lonely street, passing over Foster street, then through Bienville street, southwestward to Lake street, across Factory street diagonally through (southwestward) the square bounded by Sycamore, Main, Cottonwood and Fourth streets to South Fourth street; from here it extended to and over South First street, through the northern portion of the Edgefield and Nashville Manufacturing Company's Lumber Yard. The chief damage in this region was mostly confined to dwellings. Within this area, Wm. Sutherland and Company, with their usual forethought, wisely erected a large and elevated dyke before their plant, which was five and one-half feet below the water. They saved their entire stock.

Area number three on the east side of the river reached from Bridge avenue to North Second street; it ran parallel with North Second street to Fatherland street, thence eastward over the Shelby bottom lands, beyond the corporation. This region contained but few houses which were inundated. Prewitt, Spurr & Co.'s lumber yard and planing mill was entirely surrounded by water. Their works were securely protected by booms. Much of their lumber, however, was upset by the rising water. A gauge reading of 49.3 feet was reached at 7 a. m. of the 10th; the rise was scarcely appreciable at 8.30 a. m.; the water remained stationary until 4.35 of the 11th, when it began receding slowly. On the 15th the river was again within its banks. The injury to farming lands in the upper counties was considerable. The damage would have been twice as great had not timely warning been given. In many cases the wheat crop became a total loss. Much fencing was destroyed.

The following practical illustration may tend to show the great usefulness to which the Cumberland River service has attained in this community; the total expense incurred during the floods at the special river stations from March 31st to April 15th, was:

Burnside, Kentucky:	
Services of special observer	$7 00
Expense of telegraphing	3 00
Carthage, Tennessee:	
Services of special observer	10 00
Expense of telegraphing	7 80
Total cost	27 80

This total cost of the special river service is an insignificant sum in comparison to the money value of property saved here and at Clarksburg, forty miles below.

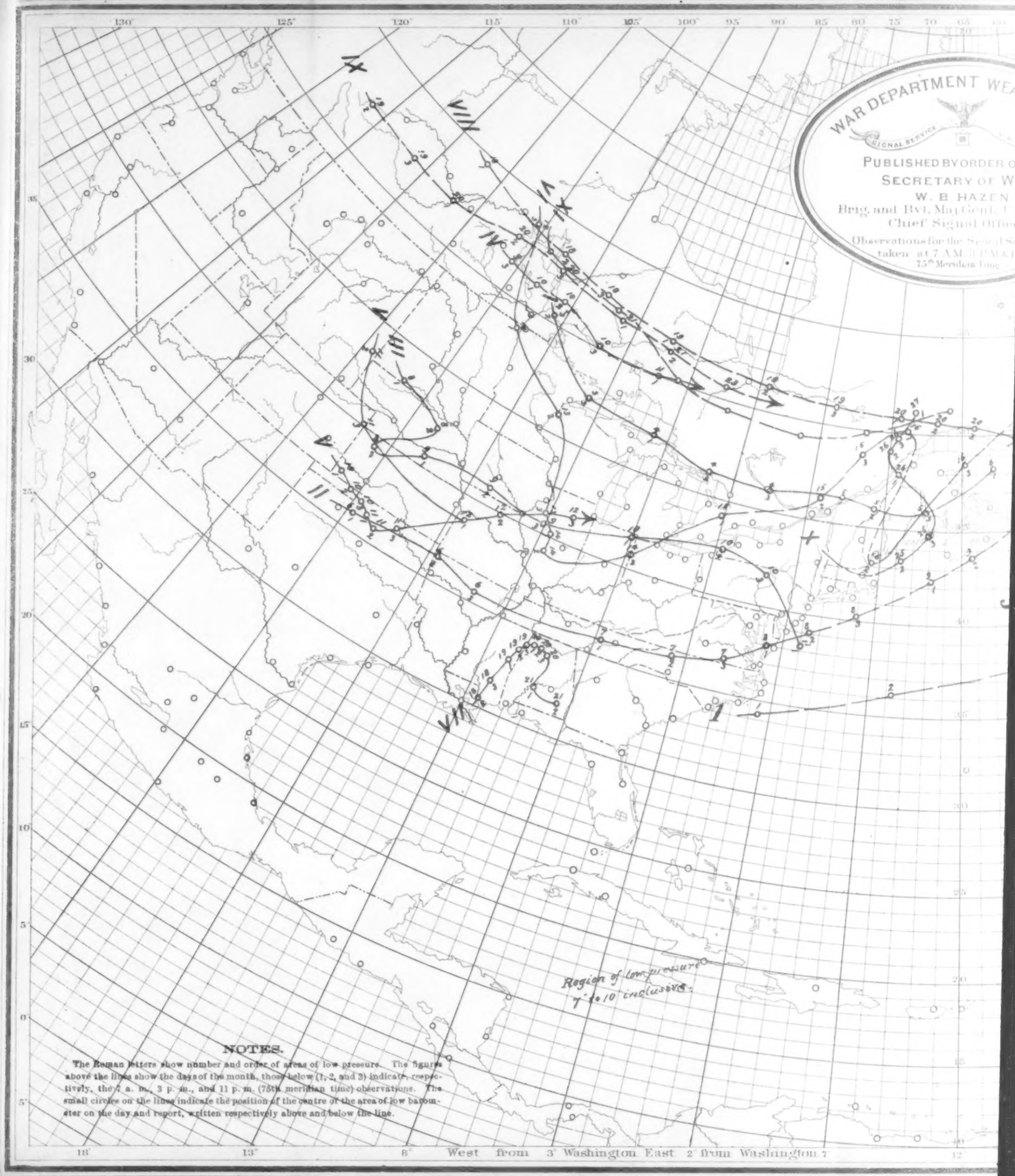
The following table shows the amount of damage, expressed in money value, which occurred in and around Nashville during the floods of March 31 to April 15, 1886, estimated with great care and accuracy:

Name.	Business.	Actual loss.	Estimated loss if warnings had not been given.
Prewitt, Spurr and Company	Lumber, hard woods, buckets, &c.	$350	$10,000
Edfield and Nashville Manufacturing Company.	Doors, veneering, and fancy wood work.	200	700
William Sutherland and Company	Lumber and planing mill	.....	4,000
Nashville Cooperage Company	Barrels and buckets	350	900
B. S. Rhea and Son, grain elevator	Corn, oats, and wheat	.....	500
Indiana Lumber Company	Straight lumber	350	800
Leibmann, Lovemann and O'Brien	Lumber, doors, sash, and blinds	.....	400
Steamboat interests	.....	.....	1,100
Nashville Lumber Company	Lumber and hard woods	.....	600
City water-works	.....	200	3,000
Nashville Blood Horse Association	Stables, &c	300	2,000
Cooper and Company	Lime, plaster, cement, &c	250	5,000
B. G. Wood	Boilers and smithing	25	200
Brick yards	.....	5,000	9,000
Miscellaneous household goods, street-car obstruction, &c.	.....	35,000	90,000
Total	.....	42,225	128,200

The two years' experience with the river system has already fully demonstrated that it is practicable for the prediction of rises to within one and two feet at this point. The greatest difficulty to be overcome is the uncertainty in regard to the time which it takes the waves to reach Nashville from the headwaters. This rate of progress varies with different stages of the water. If the water is at a low stage at Carthage and Nashville the waves travel slower from Burnside downward; should the water be moderately high, say fifteen to twenty feet, at Nashville and Carthage, the rate of flow is faster.

Form 106 C 1884.

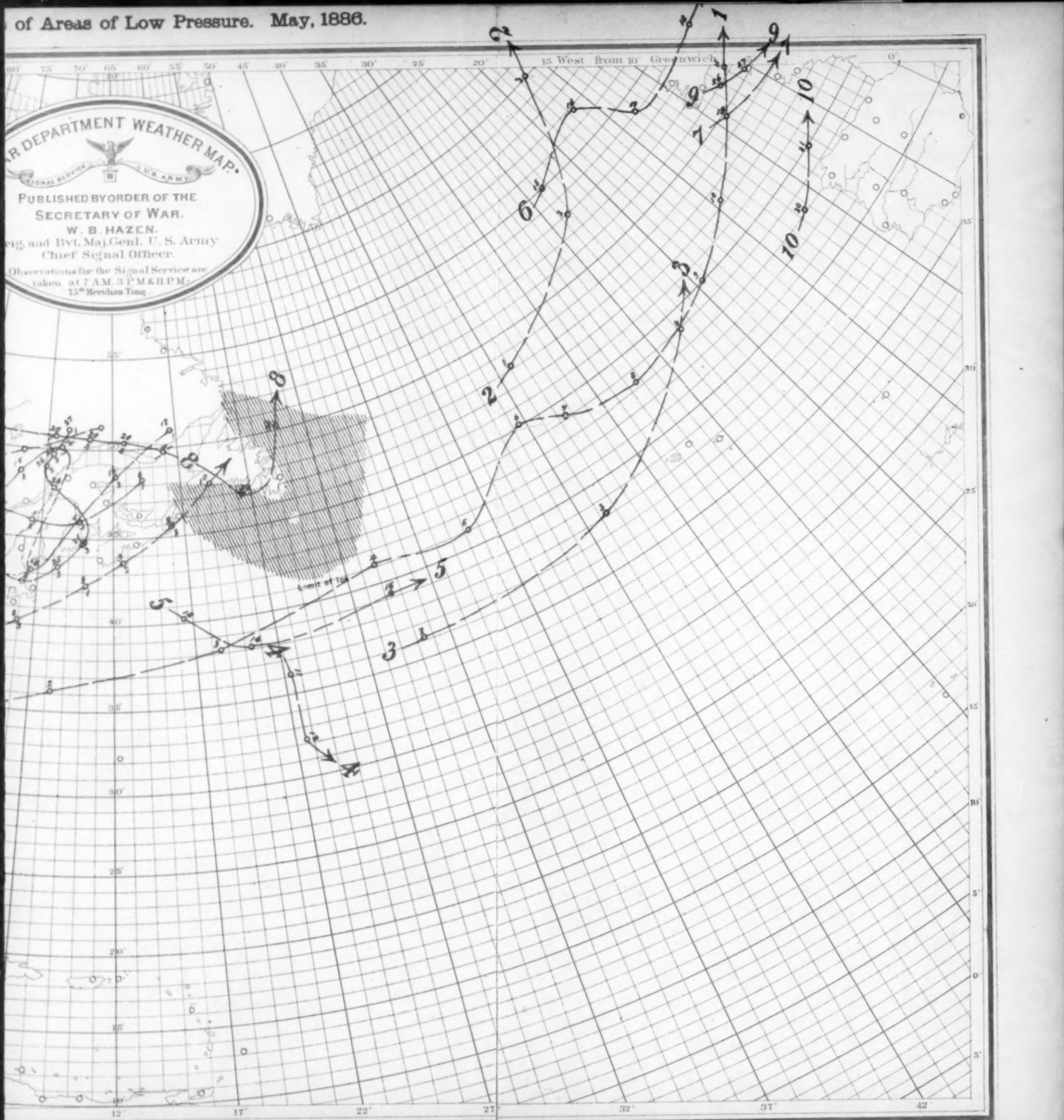
Chart I. Tracks of Areas of Low


WAR DEPARTMENT WEA
SIGNAL SERVICE
PUBLISHED BY ORDER O
SECRETARY OF W
W. B. HAZEN
Brig. and Bvt. Maj. Genl. U
Chief Signal Office
Observations for the Second S
taken at 7 AM. 3 P.M. & 1
75th Meridian Time
Region of low pressure
7 to 10 inclusive.
130° 125° 120° 115° 110° 105° 100° 95° 90° 85° 80° 75° 70°
35 30 25 20 15 10 5 0 5°
18° 13° 8° West from Washington East from Washington 7 12

NOTES.

The Roman letters show number and order of areas of low pressure. The figures above the lines show the days of the month, those below (1, 2, and 3) indicate, respectively, the 7 a. m., 3 p. m., and 11 p. m. (75th meridian time) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

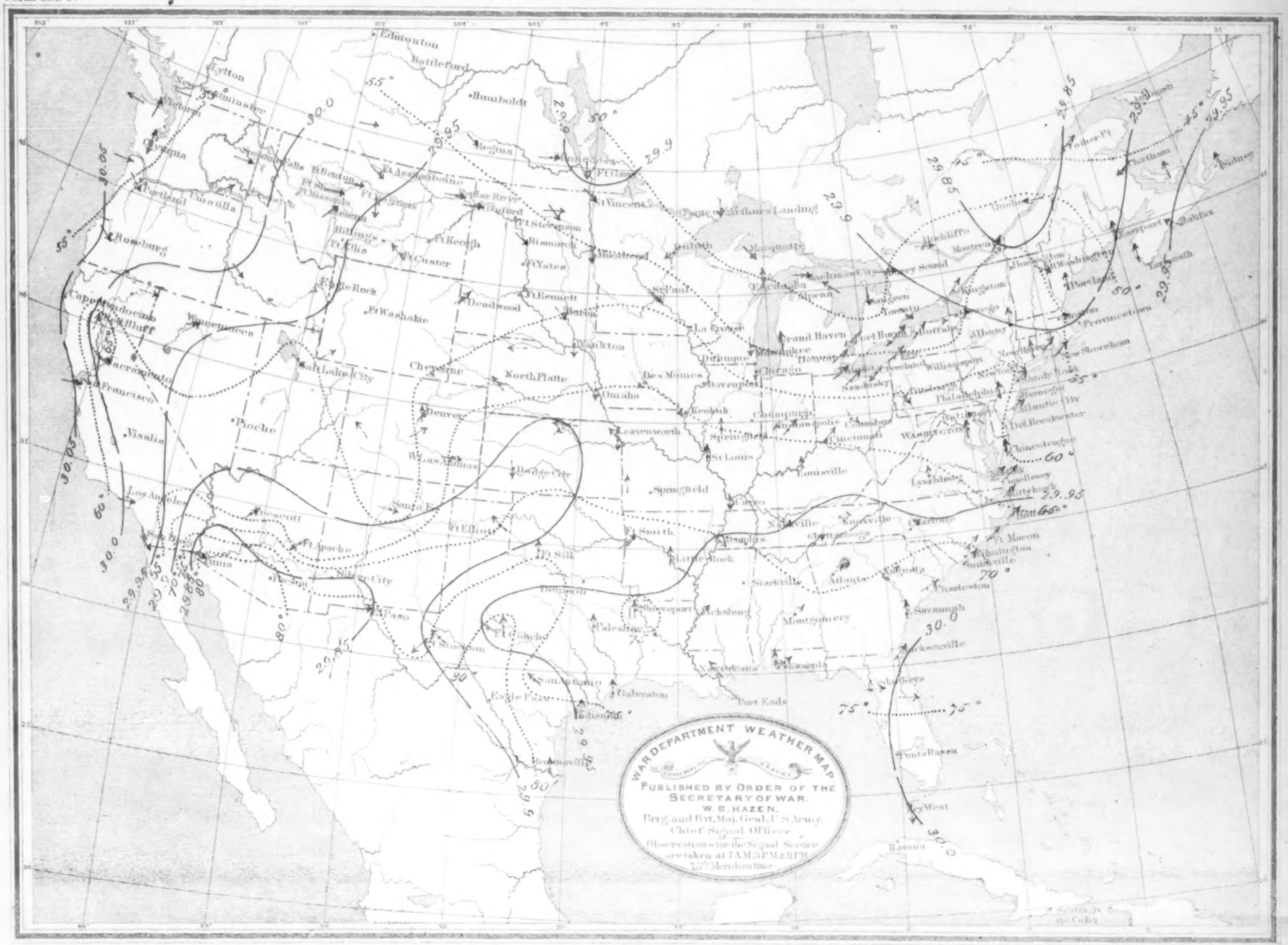
# of Areas of Low Pressure. May, 1886.



Signal Office Lith.

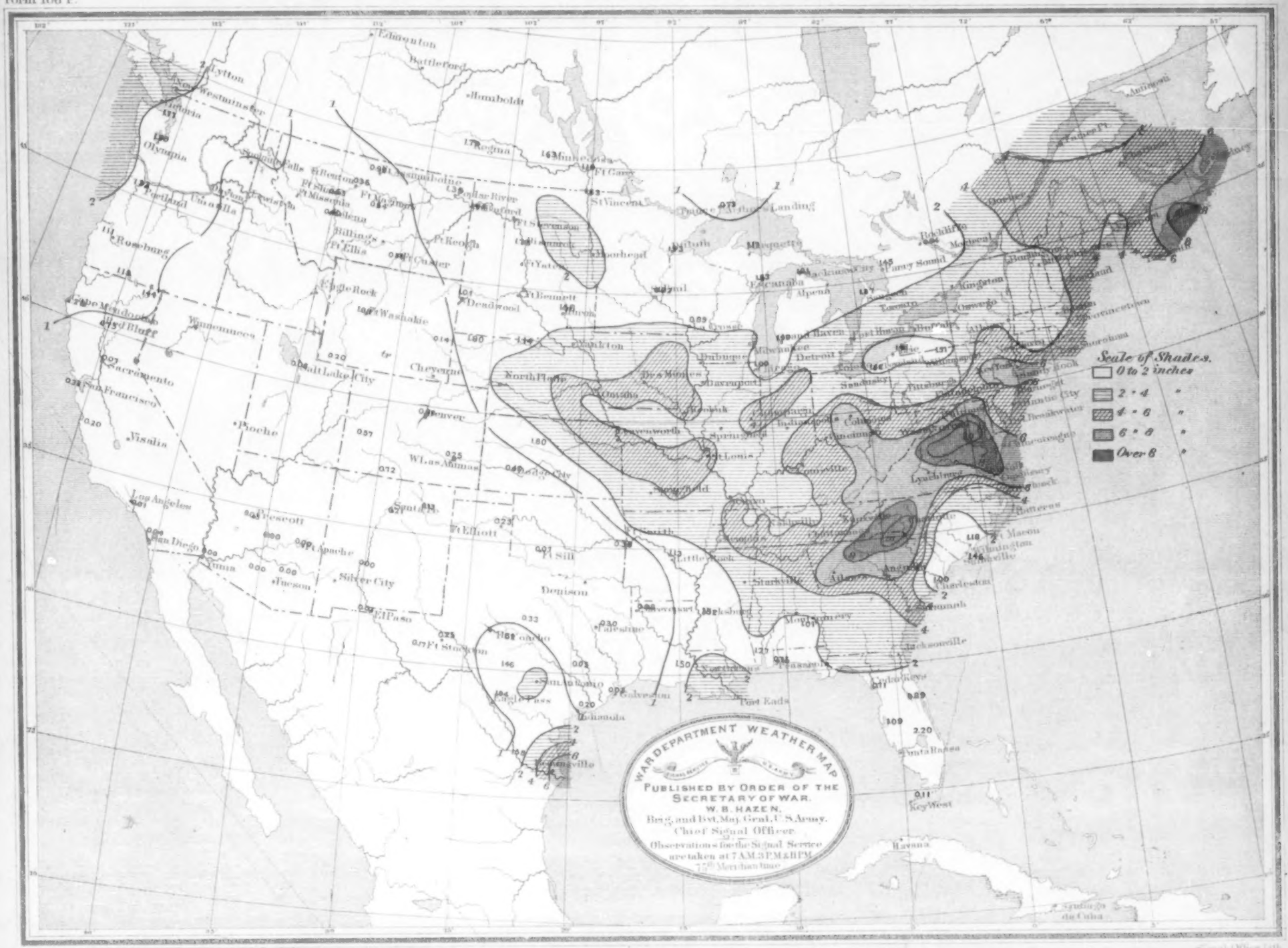
Form 106 F.

Chart II. Isobars, Isotherms, and Winds. May, 1886.


WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. HAZEN,
Brig. and Brt. Maj. Genl. U.S. Army,
Chief Signal Officer.
Observations in the Signal Service are taken at 7 A.M. 3 P.M. & 11 P.M. 75th Meridian time.

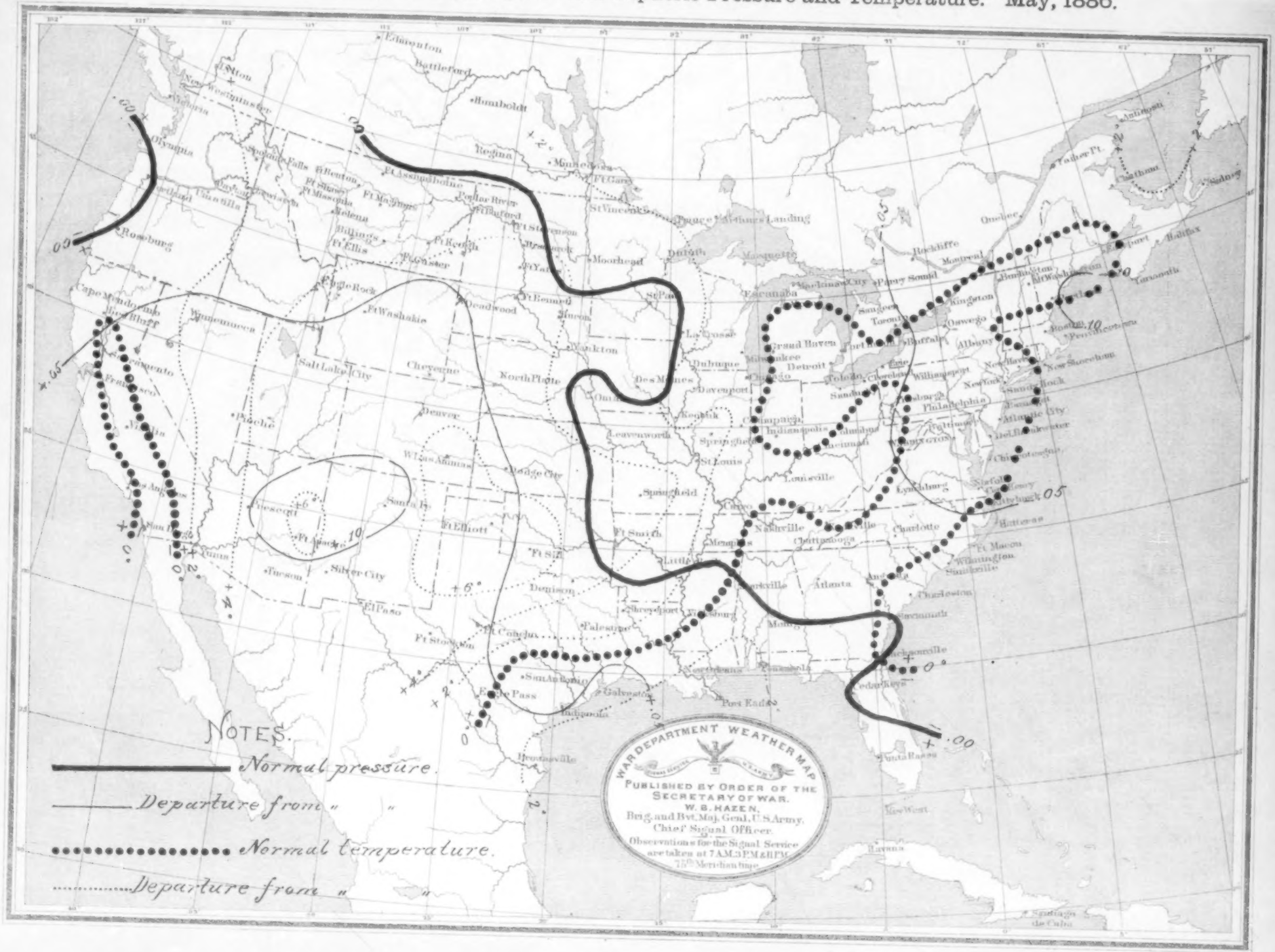
Form 106 F.

Chart III. Precipitation, May, 1886.


Scale of Shades.
0 to 2 inches
2 - 4 "
4 - 6 "
6 - 8 "
Over 8 "
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. HAZEN,
Brig. and Bvt. Maj. Genl. U. S. Army.
Chief Signal Officer.
Observations for the Signal Service are taken at 7 A.M. 3 P.M. & 11 P.M. 75th Meridian time.

Form 106 F.

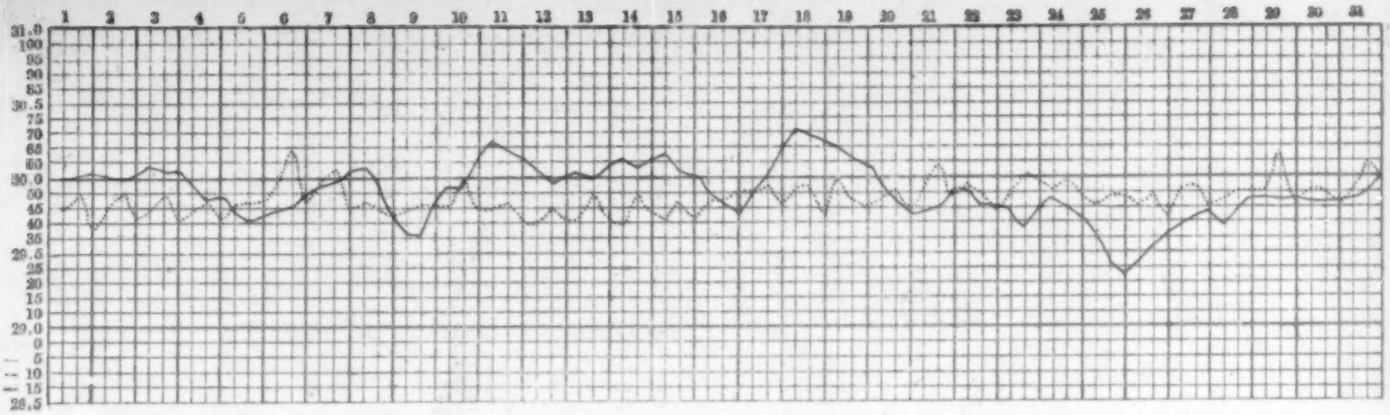
Chart IV. Departures from Normal Atmospheric Pressure and Temperature. May, 1886.


NOTES.
Normal pressure.
Departure from " "
Normal temperature.
Departure from " "
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. HAZEN,
Brig. and Bvt. Maj. Genl. U.S. Army,
Chief Signal Officer.
Observations for the Signal Service are taken at 7 A.M. 3 P.M. & 11 P.M. 75th Meridian time.

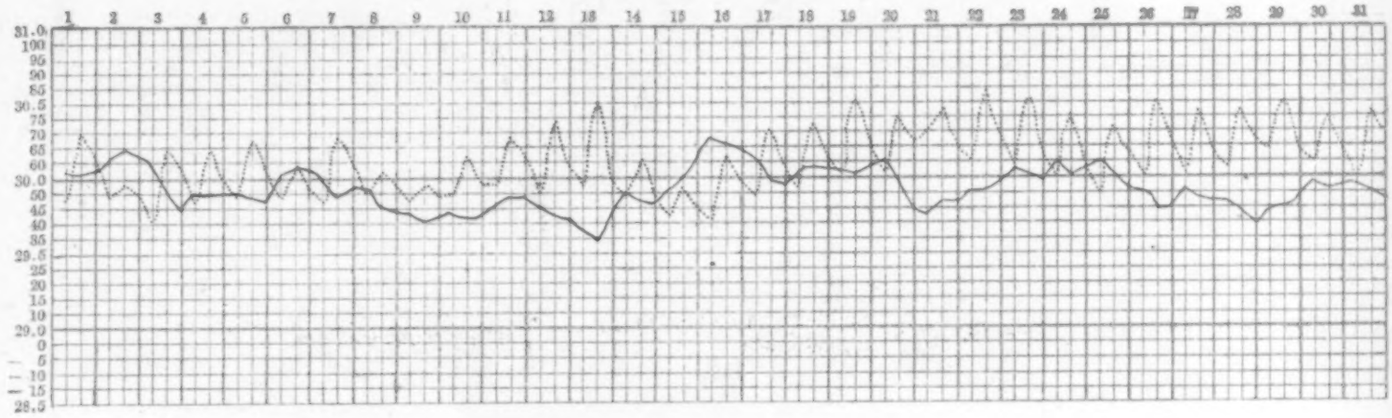
Signal Office Lith.

Chart V. Pressure (———) and Temperature (- - - -) Curves. May, 1886.

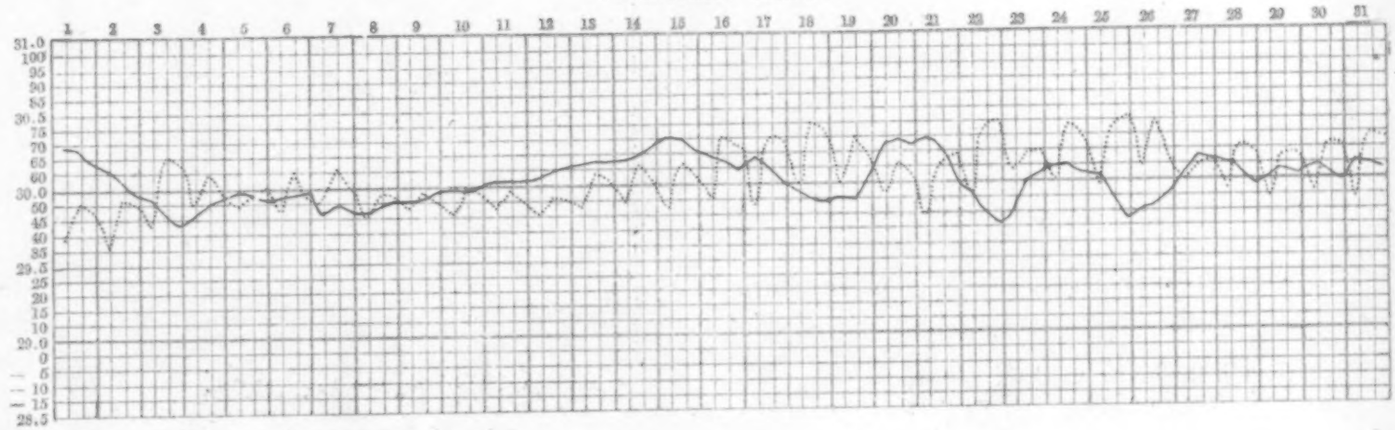
EASTPORT, ME.



SAINT PAUL, MINN.



PORTLAND, OREG.



NEW ORLEANS, LA.

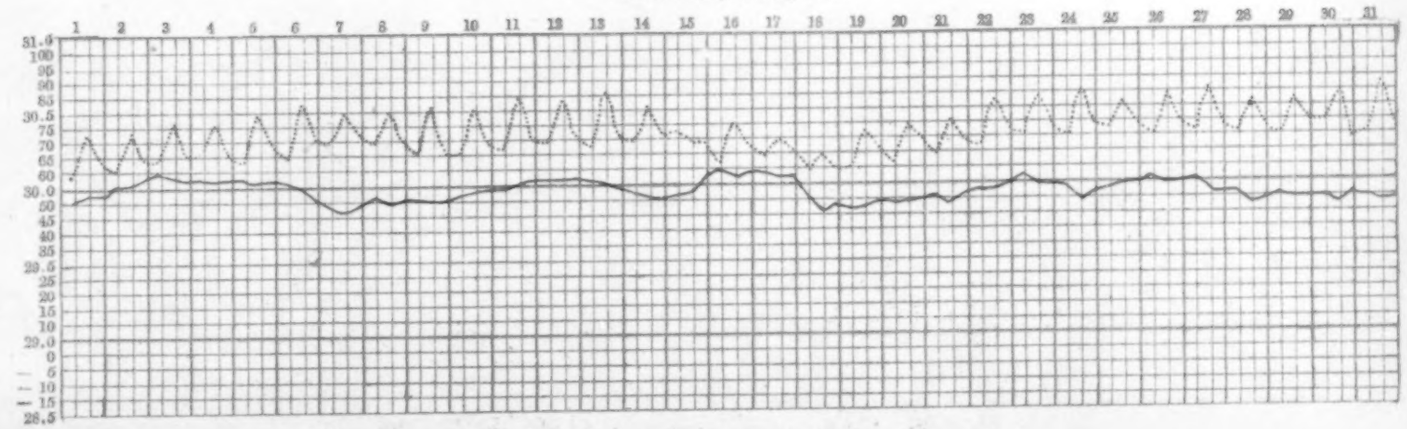
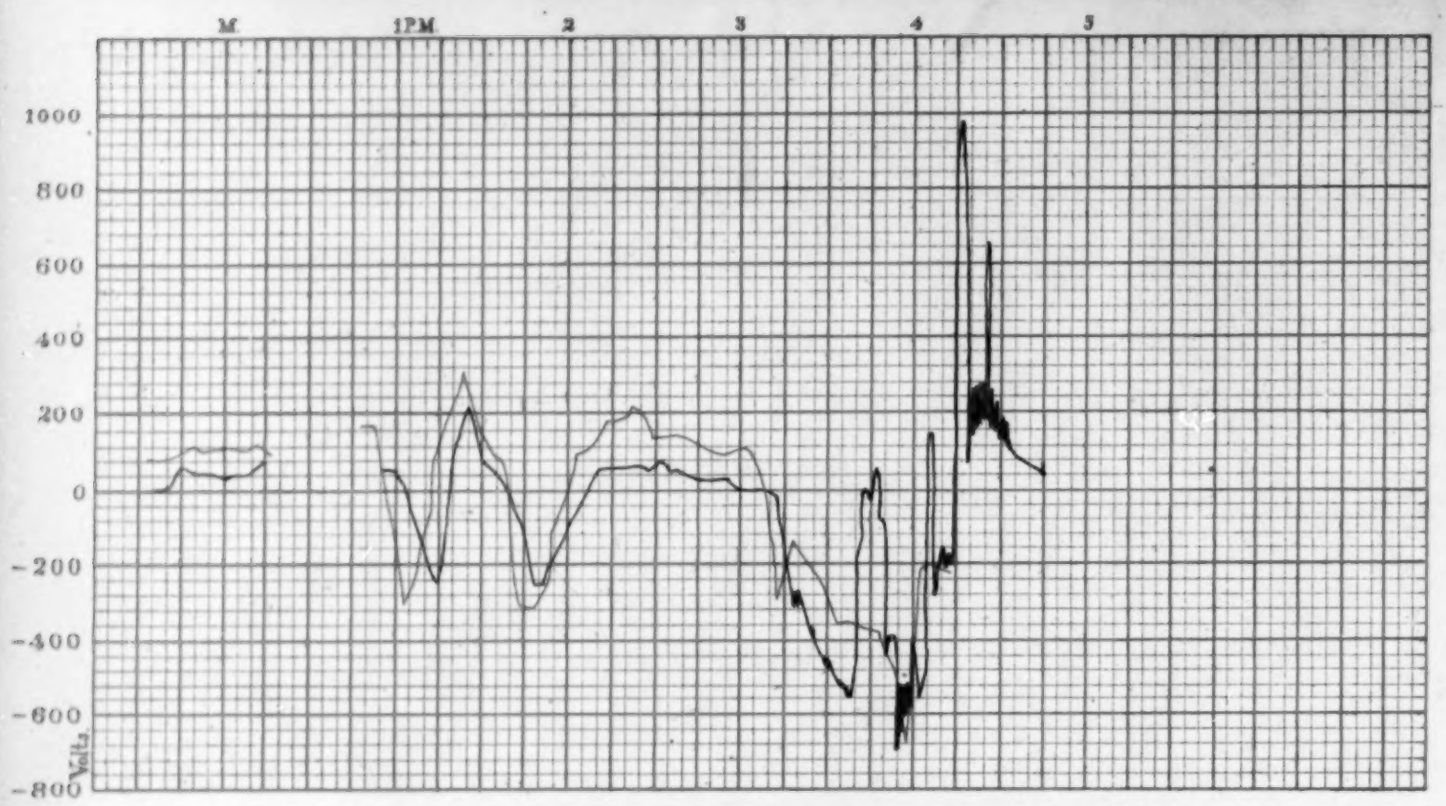
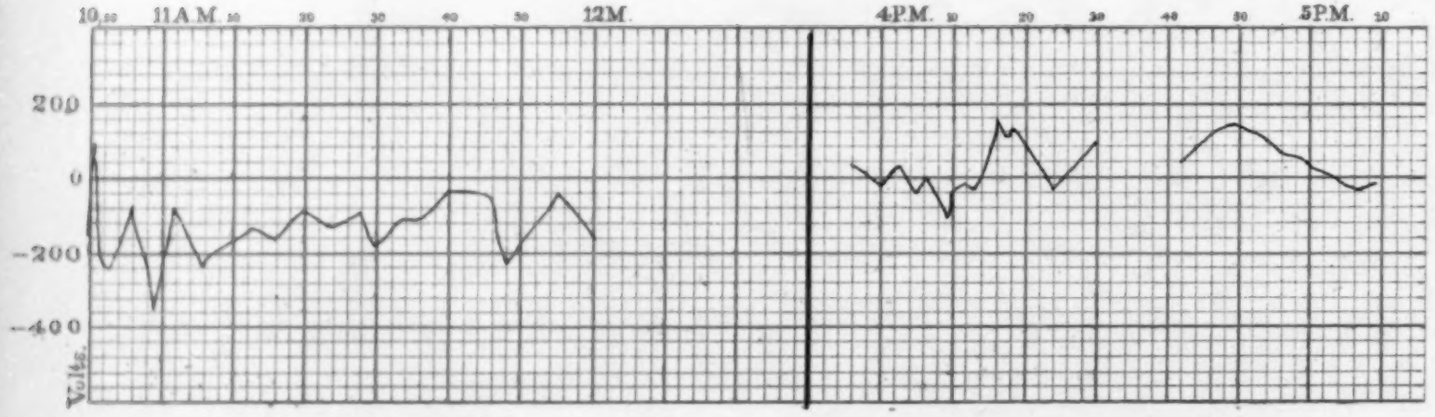


Chart VI. Curves showing Simultaneous Readings of Electrometers.

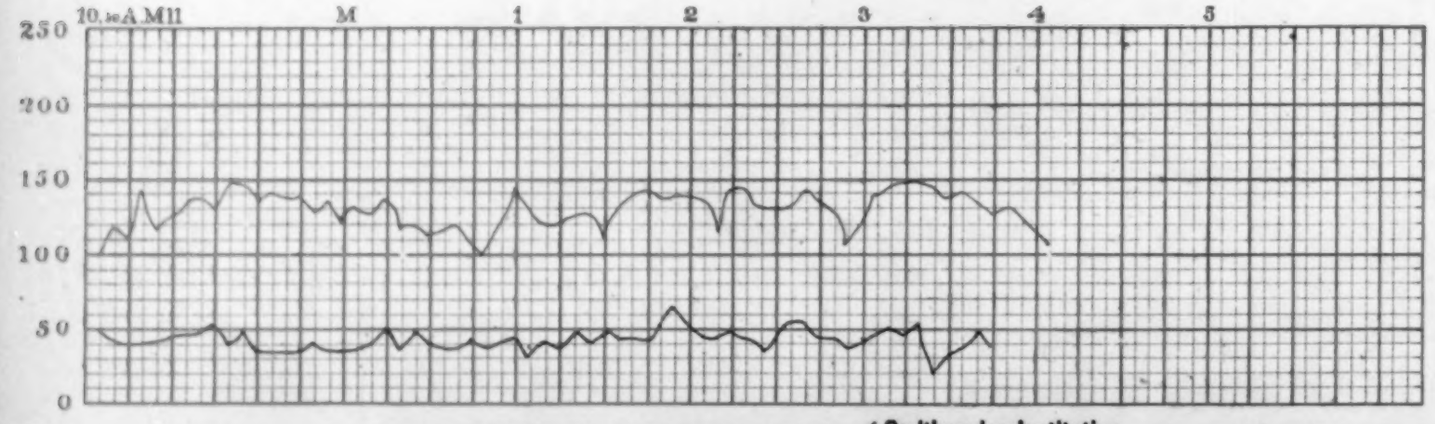


June 14, 1886. Smithsonian Institution _____ } during thunder-storm.
Signal Office _____ }



April 6, 1886. NEW HAVEN, CONN.
Heavy rain and high northeast winds.

April 24, 1886. NEW HAVEN, CONN.
Thunder-storm from 4.00 to 5.10 p. m.; heavy rain; frequent thunder; high wind about 4.10 p. m.



June 11, 1886. Simultaneous observations at { Smithsonian Institution _____
Signal Office _____

Voluntary observers of the Signal Service, on land, from whom meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for May, 1886.

Observer and place of observation.
Adams, Edie, Logan, Iowa.
Alexander, S., Birmingham, Mich.
Anderson, Dr. W. W., Statesburg, S. C.
Altaffer, J. M., Independence, Kans.
Adams, Dr. O. H., Vineland, N. J.
Abbott, Dr. E. K., Salinas, Cal.
Arents, Hiram, Oroville, Cal.
Avey, O. H., Oskaloosa, Iowa.
Adams, A. H., Fort Meade, Fla.
Anderson, Prof. J. T., Fayette, Mo.
Bushnell, W. S., Monticello, Ind.
Beutky, David, Princeton, Cal.
Bryant, A. T., Yutan, Nebr.
Bisbee, Capt. Lewis, Buckfield, Me.
Boerner, Prof. Chas. G., Vevay, Ind.
Boynton, John F., Syracuse, N. Y.
Bayerly, J. F., Spartanburg, S. C.
Ballou, Dr. N. E., Sandwick, Ill.
Bennett, Geo., Bandon, Oreg.
Bell, Joseph, Franklin, Pa.
Brainerd, Dr. H. G., Independence, Iowa.
Baker, Dr. Henry B., Lansing, Mich.
Beall, Dr. R. L., Lenoir, N. C.
Brendel, Dr. Fred., Peoria, Ill.
Bartlett, E. B., Vermillion, N. Y.
Baldwin, A. L., Bethel, Conn.
Briggs, John, Albany, Oreg.
Betts, Prof. Arthur, Webster, Dak.
Breed, J. E., Embarras, Wis.
Boyd, Joseph, Oskaloosa, Iowa.
Boles, Lieut. A. H., Hudson, Mich.
Beans, T. J., Moorestown, N. J.
Barney, W., Stowe, Vt.
Blachly, C. P., Manhattan, Kans.
Bridges, Q. A., Berlin Mills, N. H.
Beecher, Chas., Wysox, Pa.
Bowman, Peter, Ruggles, Ohio.
Cook, S. A., Milledgeville, Ga.
Carrington, C. D., Brownville, Nebr.
Crump, M. H., Bowling Green, Ky.
Charbonnier, Prof. L. H., Athens, Ga.
Casey, Geo., Auburn, N. Y.
Crawford, E. A., Liberty Hill, Lh.
Curtiss, G. G., Fallston, Md.
Cornell University, Ithaca, N. Y.
Cutting, Dr. Hiram A., Lunenburg, Vt.
Crosier, Adam, Lavonia, Ind.
Caulkins, John S., Thornville, Mich.
Cass, John J., Allison, Kans.
Cleveland, Dr. G. H., Pentwater, Mich.
Carpenter, Dr. W. B., Leavenworth, K.
Christ, Jacob, Franklin, Wis.
Cheney, Wm., Minneapolis, Minn.
Culver, G. E., Vermillion, Dak.
Carter, Rev. Dr. W. H., Tallahassee, Fla.
Comstock, Prof. F. M., Le Roy, N. Y.
Collin, Prof. A., Mount Vernon, Iowa.
Cummings, L. D., Palmyra, N. Y.
Charlton, Prof. O. E., Ottawa, Kans.
Chubbs, Thos. H., Post Mills, Vt.
Cole, Seward, Cahuenga, Cal.
Cutler, H. B., Heath, Mass.
Childs, W. H., Brattleborough, Vt.
Clark, T. A., Weldon, N. C.
Cochran, Wm. P., Wakefield, Kans.
Colton, Prof. G. H., Hiram, Ohio.
Caffee, Wm. K., Carthage, Mo.
Chandler, Dr. W. J., South Orange, N. J.
Cass, W. Earle, Roseland, N. J.
Calhoun, P. B., Austin, Tenn.
Chapin, Adams, Poway, Cal.
Dudley, C. B., Altoona, Pa.
Dazey, J. B., Charleston, Ill.
Dow, Roswell, Sycamore, Ill.
Deming, H. D., Wellsborough, Pa.
Dozier, Wm., Mattoon, Ill.
Dewhurst, Rev. E., Voluntown, Conn.
Day, Theodore, Dyberry, Pa.
Dawson, Wm., Spiceland, Ind.

Observer and place of observation.
Davis, W. O., Bloomington, Ill.
Dinsmore, Jr., Prof. T. H., Emporia, Kans.
Everett, Dr. J. T., Clyde, Ohio.
Ellsworth, W. W., Hartford, Conn.
Elliason, W. A., Statesville, N. C.
Eckstein, Rev. M., Conception, Mo.
Ellis, John, Marquette, Nebr.
Ewell, Dr. M. D., South Evanston, Ill.
Fox, F. E., Fall Brook, Cal.
Fox, G. W., Marietta, Cal.
Ford, H. C., El Dorado, Kans.
Ferris, B. F., Sunman, Ind.
Friend, Chas. W., Carson City, Nev.
Fleming, J., Readington, N. J.
Field, Theo. G., Parkersburg, W. Va.
Ferguson, W., Paterson, N. J.
Fernald, Prof. M. C., Orono, Me.
Frick, John H. Warrenton, Mo.
Foss, E. T., Hydesville, Cal.
Fuller, Edw. N., Tacoma, Wash. T.
Gore, Prof. J. W., Chapel Hill, N. C.
Gibson, J. H., Salina, Kans.
Gates, W. B., Burlington, Vt.
Grathwohl, John, Blooming Grove, Pa.
Gillingham, Milnor, Fallsington, P.
Gardiner, R. H., Gardiner, Me.
Gowey, H. D., North Lewisburg, Ohio.
Green, Dr. Jesse C., West Chester, Pa.
Gerrish, S. H., Sacramento, Cal.
Gray, J. W., Stockham, Nebr.
Goodwin, Wm., North Colebrook, Conn.
Goodspeed, Chas. W., Elyria, Ohio.
Gillingham, W., Accotink, Va.
Gerlick, Rev. Dr. J. R., Burlington, Va.
Gray, Capt. A. W., Kenewick, Wash. T.
Heath, E. R., Wyandotte, Kans.
Hippie, J. E., Dakota City, Dak.
Harvard College Observatory, Cambridge, Mass.
Hammitt, John W., College Hill, Ohio.
Heaton, Isaac E., Fremont, Nebr.
Hoskinson, R. M., Bainbridge Island, Wash T.
Heacock, J. L., Quakertown, Pa.
Hyde, G. A., Cleveland, Ohio.
Haywood, John, Westerville, Ohio.
Hartzler, J. A., Mottville, Mich.
Hole, Joseph, Butlerville, Ind.
Hager, Mrs. L. G., Terre Haute, Ind.
Howe, Prof. J. L., Richmond, Ky.
Houghton Farm Experiment Station, Mountainville, N. Y.
Heatwole, L. J., Dale Enterprise, Va.
Hazen, Rev. A. Deerfield, Mass.
Hamilton, W. H., Corsicana, Tex.
Hatch, A. H., Windsor, Ill.
Harris, W. C., Dover, N. J.
Hodge, Rev., F. B., Wilkesbarre, Pa.
Humphrey, Dr. L., Fairbury, Nebr.
Harris, T. C., Raleigh, N. C.
Hanson, Olof. Kendall Green, D. C.
Hunter, Dr. T. C., Napoleon, Ohio.
Hall, Chas. C., Dudley, Mass.
Horn, Dr. H. B., Atchison, Kans.
Hurlin, Rev. Wm., Antrim, N. H.
Helm, Thos. B., Logansport, Ind.
James, John W., Marengo, Ill.
Jones, Dr. E. U., Taunton, Mass.
Jackson Company, Nashua, N. H.
Jordan, Dr. M. D. L., Milan, Tenn.
Jones, Ira B., Neillsville, Wis.
Jones, P. M., Puerto de Luna, N. Mex.
Kirkwood, E., Maxuy, Ind.
Knapp, J. G., Limona, Fla.
Keese, G. Pomeroy, Cooperstown, N. Y.
Kuhne, F. W., Fort Wayne, Ind.
King, W. R., Yellow Springs, Ohio.
Kent, Miss E. Ely, Phillipsburg, N. J.

Observer and place of observation.
Kedzie, D. H. Midland, Tex.
Keese, G. Pomeroy, Cooperstown, N. Y.
Lovewell Prof. J. T., Topeka, Kans.
Lueps, Miss Anna, Manitowoc, Wis.
Lincoln, A. T., Marion, Va.
Loomis, J. C., Jeffersonville, Ind.
Luther, S. M., Garrettsville, Ohio.
Ladshaw, Geo. E., Pacolet, S. C.
Lamb, Miss Bertha E., Sterling, Kans.
Loud, Prof. F. H., Colorado Springs, Colo.
Laughlin, D. L., Knightstown, Ind.
Lerch & Rice, Bethlehem, Pa.
Lamar, T. J., Prattville, Ala.
Loundes, R. T., Clarksburg, W. Va.
Memminger, E. R., Flat Rock, N. C.
Morgan, L. Ray, Philipsburg, Pa.
Miller, H. D., Drifton, Pa.
McNeill, M., Princeton, N. J.
Matzinger, Rev. P. F., Preston, Minn.
Munn, A. M., Kalamazoo, Mich.
McDonogh Institute, McDonogh, Md.
McCready, Miss L. A., Fort Madison, Iowa.
Moore, C. R., Bird's Nest, Va.
Micklen, J. H., Variety Mills, Va.
McKenzie, Dr. M., Centreville, Mo.
Macrae, Colin, Kirkwood, S. C.
Meehan, Thos., Germantown, Pa.
Moore, Nathan, Grampian Hills, Pa.
Mikesell, Thos., Wauseon, Ohio.
Marshall, G., Creston, Iowa.
Mitchell, Dr. D. W., Harrisville, Mich.
Moore, Dr. J. W., Easton, Pa.
Motte, L. S., West Milton, Ohio.
Marshall, Gregory, Creseo, Iowa.
Newbegin, John D., Anna, Ill.
Newcomb, G. S., Westborough, Mass.
Norcom, Prof. T. J., Reidsville, N. C.
Neal, Dr. J. C., Archer Fla.
Olds, H. D., Cedar Rapids, Iowa.
Owsley, Dr. J. B., Jacksonborough, O.
Osborn, Dr. T. C., Cleburne, Tex.
Penrod, Dr. H. J., Upper Mont Clair, N. J.
Pearce, Thomas, Eola, Oreg.
Peele, Capt. A., New Westminster, B. C.
Partrick, J. M., North Volney, N. Y.
Purdue University, Lafayette, Ind.
Pettersen, Dr. F., Comfort, Tex.
Pendleton, A., Nicolaus, Cal.
Phillips, W. R., Evansville, Wis.
Postma, H. Y., Egg Harbor City, N. J.
Roeder, W. F., Zionsville, Pa.
Roberts, Luke, Clinton, Iowa.
Rotch, A. L., Blue Hill Obs'y, Mass.
Romig, J. K., La Grande, Oreg.
Randall, E. H., Poultney, Vt.
Renfew, H. N., Bancroft, Iowa.
Remington, C. V. S., Fall River, Mass.
Robertson, T. D., Rockford, Ill.
Rogers, F. M., Luling, La.
Rerick, R. H., La Grange, Ind.
Rodman, T. R., New Bedford, Mass.
Runge, C., New Ulm, Tex.
Richardson, C. F., Beverly, N. J.
Rockwood, Prof. C. G., Princeton, N. J.
Starr, Prof. F. Cedar Rapids, Iowa.
Shaw, E. Ninnescah, Kans.
Strong, W. C., Kent's Hill Me.
Sanders, T. B. Stonyville, Cal.
Simmons, Prof. W. G., Wake Forest, N. C.
Shriver, E. T., Cumberland, Md.
Seltz, Chas., De Soto, Nebr.
Scott, Thos. G., Forsyth, Ga.
Stucky, Dr. C. T., Helvetia, W. Va.
Shute, Elisha, Somerset, Mass.
Shriver, Howard, Wytheville, Va.
Sonedecker, Rev. T. H., Fostoria, Ohio.

Observer and place of observation.
Stunkard, L. E., East Brook, Pa.
Sleaker, Mrs. E. D., Snowville, Va.
Snow, Prof. F. H., Lawrence, Kans.
Sim, J. R., Summit, Va.
Scribner, H. F. J., Strafford, Vt.
Strong, S. B., Setauket, N. Y.
Somerville, W. B., Birmingham, Ala.
Samostz, Oscar, Austin, Tex.
Shepard, E. M., Springfield, Mo.
Safford, A. T., Williamstown, Mass.
Sherman, W. B., Manchester, Iowa.
Standenmayer, Dr. L. R., Lincolnton, N. C
Spilman, J. J., Pierce City, Mo.
Swezey, Prof. G. D., Crete, Nebr.
Sacred Heart College, Prairie du Chien, Wis.
Stalls, T. J., Paris, Tenn.
Snell, S. C., Amherst, Mass.
Tilford, C. M., Mount Blanco, Tex.
Trembley, Dr. J. B., Oakland, Cal.
Todd, Prof. David P., Amherst, Mass.
Thornton, Prof. N., Geneseo, Ill.
Teele, Rev. A. K., Blue Hill, Mass.
Truman, Geo. S., Genoa, Nebr.
Turnbo, Silas C., Pro Tem, Mo.
Tillinghast, C. B., Albany, N. Y.
Underhill, Dr. C. B., Salida, Colo.
Vail, Hugh D., Santa Barbary, Cal.
Voegell, Adolphus, Des Moines, Iowa.
Wistrom, Mark F., Leonard, Kans.
Went, E. C., Frankfort, Ky.
Washburn Observatory, Madison, Wis.
Wild, Rev. E. P., Newport, Vt.
Williams, Rev. C. F., Ashwood, Tenn.
Wing, Miss M. E., Charlotte, Vt.
West, Silas, Cornish, Me.
Wylie, Wm., Mount Forest, Canada.
Walton, J. P., Muscatine, Iowa.
Wait, S. E., Traverse City, Mich.
Woodstock College, Woodstock, Md.
Wetmore, Edw. L., Tucson, Ariz.
Wolfe, John H., Wellington, Kans.
West, Dr. Jos. O., Princeton, Mass.
Washington Aqueduct. — Receiving Reservoir, D. C; Distributing "; Great Falls Reservoir, Md; Rock Creek Bridge, D. C.
Winipiseogee Lake Cotton and Woolen Manufacturing Co. — Weir's Bridge, N. H.; Woodstock, N. H.; Wolfborough, N. H.; Lake Village, N. H.; Bristol, N. H.; Belmont, N. H.; Ashland, N. H.
Willis, O. R., A. M., Ph. D., White Plains, N. Y.
Watters, Dr. Jas., Westmoreland, Kans.
Willia ns, Dr. A. C., Elk Falls, Kans.
Wigg, Dr. Geo., East Portland, Oreg.
Wright, J. W. A., Greensborough, Ala.
Whitmore, J. E., Gallinas Spring, N. Mex.
Wadsworth, Dr. J. L. R., Collinsville, Ill.
Widman, Rev. C. M., Grand Coteau, La.
Williams, Dr. A. C., Elk Falls, Kans.
Watson, Evan, Fort Scott, Kans.
White, Rev. J. H., Merritt's Island, Fla.
Whitney, Chas. E., Humphrey, N. Y.
Wilson, W. T., Clayton, N. J.
Wood, Joseph, Bar Harbor, Me.
Woody, Rev. C. A., Pendleton, Oreg.
Wearmouth, J., University of Virginia, Va.
Waterman, Wm., Hay Springs, Nebr.
Wedge, J. C., Fond du Lac, Wis.
Yetter, Wm. G., Catawissa, Pa.
Yates, T. P., Factoryville, N. Y.
Young, Geo. R., Penn Yan, N. Y.

Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for May, 1886.

Alcatraz Island, Cal.	Cœur d'Alene, Ft., Idaho.	Keogh, Fort, Mont.	McDowell, Fort, Ariz.	Reno, Fort, Ind. T.	Supply, Fort, Ind. T.
Angel Island, Cal.	Columbus, Fort, N. Y. H.	Lowell, Fort, Ariz.	McHenry, Fort, Md.	Riley, Fort, Kans.	Totten, Fort, Dak.
Assinaboine, Fort, Mont.	Concho, Fort, Texas.	Laramie, Fort, Wyo.	Mount Vernon B'ks, Ala.	Ringgold, Fort, Tex.	Townsend, Ft., Wash. T.
A. Lincoln, Fort, Dak.	David's Island, N. Y. H.	Lewis, Fort, Colo.	Niagara, Fort, N. Y.	Snelling, Fort, Minn.	Union, Fort, N. Mex.
Benicia Barracks, Cal.	Ellis, Fort, Mont.	McIntosh, Fort, Tex.	Niobrara, Fort, Nebr. [Cal.	Saint Augustine, Fort, Fla.	Verde, Fort, Ariz.
Bidwell, Fort, Cal.	Fred Steele, Fort, Wyo.	Missoula, Fort, Mont.	Presidio of San Francisco,	Sisseton, Fort, Dak.	Washakie, Fort, Wyo.
Brady, Fort, Mich.	Gaston, Fort, Cal.	Mason, Fort, Cal.	Plattsburg Barracks, N. Y.	Shaw, Fort, Mont.	West Point, N. Y.
Bridger, Fort, Wyo.	Halleck, Fort, Nev.	Madison Barracks, N. Y.	Pembina, Fort, Dak.	Selden, Fort, Nebr.	Walla Walla, Ft., Wash. T.
Bayard, Fort, N. Mex.	Hays, Fort, Kans.	McDermit, Fort, Nev.	Randall, Fort, Dak.	Sidney, Fort, Nebr.	Yates, Fort, Dak.
Boisé, Fort, Idaho.	Klamath, Fort, Oreg.	Monroe, Fort, Va.			

State weather services from which meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for May, 1886.

Alabama State Weather Service, under direction of Prof. P. H. Mell, jr., Auburn, Alabama.
Georgia Weather Service, under direction of Hon. J. T. Henderson, Commissioner of Agriculture, Atlanta, Georgia.
Indiana State Weather Service, under direction of Prof. H. A. Huston, La Fayette, Indiana.
Indiana State Weather Service, under direction of Prof. W. H. Ragan, De Pauw University, Greencastle, Indiana.
Minnesota State Weather Service, under direction of Prof. W. W. Payne, Northfield, Minnesota.
Missouri State Weather Service, under direction of Prof. Francis E. Nipher, Saint Louis, Missouri.
Nebraska Weather Service, under direction of Prof. Goodwin D. Swezey, Crete, Nebraska.
New England Meteorological Society, Prof. Winslow Upton of Providence, R. I., President; Mr. W. M. Davis, of Cambridge, Mass., Secretary.
Ohio State Weather Service, under direction of Prof. B. F. Thomas, of the Ohio State University, Columbus, Ohio.
Tennessee State Weather Service, under direction of Major H. C. Bate, Nashville, Tennessee.
Data have also been used from meteorological records of the Central Pacific and Southern Pacific railway companies.

PRICE-LIST OF

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